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ABSTRACT

Analysts of public school-district funding have recently begun to examine the allocation of resources to schools, the equity and effectiveness of school-based funding, and the productivity of the national public education system. Each of these factors may influence the educational resources that a child receives. This document contains papers by presenters at the annual National Center for Education Statistics (NCES) State Data Conference, which dealt with the perplexing persistence of financial inequity. The papers include the following: (1) "Introduction and Overview" (William J. Fowler, Jr.); (2) "Expenditures in Public School Districts: Estimates of Disparities and Anàlysis of Their Causes" (Wayne Riddle and Liane White); (3) "Teacher Resource Use Within New York State Secondary Schools" (David H. Monk, Brian O. Brent, and Christopher F. Roelke); (4) "Race, Poverty, and the Student Curriculum, 1975-95: Implications for Public Policy" (Nicola A. Alexander); (5) "Court-Ordered School Finance Equalization: Judicial Activism and Democratic Opposition" (Douglas S. Reed); (6) "Principles and Practices in Resource Allocation to Schools under Conditions of Radical Decentralization" (Brian J. Caldwell); (7) "Building Equity and Effectiveness into School-Based Funding Models: An Australian Case Study" (Peter W. Hill); (8) "Alternative Options for Deflating Education Expenditures Over Time" (Richard Rothstein and Lawrence Mishel); (9) "The Productivity Collapse in Schools" (Eric A. Hanushek); and (10) "Evaluating the Effect of Teacher Degree Level on Educational Performance" (Dan D. Goldhaber and Dominic J. Brewer). References accompany the papers. (LMI)

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National Center for Education Statistics

DEVELOPMENTS IN SCHOOL FINANCE

William J. Fowler, Jr., Editor

Fiscal Proceedings from the Annual NCES State Data Conference July 1996

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Contact:
William J. Fowler, Jr.
(202) 219–1921
Internet
William_Fowler@ed.gov

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Foreword

Paul D. Planchon, Associate Commissioner

Surveys and Cooperative Systems Group

Of all the areas within public elementary and secondary education that are experiencing rapid change, none is experiencing more turmoil than school finance. In part, this is the result of the action of state courts and state legislatures. Innovative proposals and new funding mechanisms are changing the traditional landscape of school district financing. This activity in states has created a renewed interest in school funding at the federal level.

Developments in School Finance contains papers by presenters at the annual National Center for Education Statistics (NCES) State Data Conference. The Conference attracts several state education department policymakers, analysts, and data providers from each state, who are offered training sessions and updates on developments in the field. The presenters are experts in their respective fields, each of whom has a unique perspective or interesting quantitative research to bring to bear on emerging issues in school finance. The reaction of the participants to these presentations was overwhelmingly positive. We hope that will be your reaction as well.

This report is the third publication of the proceedings of the State Data Conference. The papers are intended to promote the exchange of ideas among researchers and policymakers. Because the views are those of the authors, the papers may provoke discussions, replications, replies, and refutations. If so, the publication will have accomplished its task. There would be nothing so satisfying to the Center as promoting and contributing to the field of school finance.

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Introduction and Overview

William J. Fowler, Jr.
National Center for Education Statistics

About the Author

Dr. William J. Fowler, Jr. is an education statistician at the U.S. Department of Education, National Center for Education Statistics (NCES), who specializes in school finance and educational productivity research. His work has focused on redesigning the federal school finance data collection effort to obtain information that can provide more policy-oriented analyses for the school finance community. NCES recently reinstituted a state and school district finance data collection effort for the first time in more than a decade, and is currently funding exploratory research work.

Prior to his work at NCES, Dr. Fowler served as a supervisor of school finance research for the New Jersey Department of Education, and taught at Bucknell University and at the University of Illinois. He also served as a senior research associate for the Central Educational Midwestern Regional Educational Laboratory (CEMREL) in Chicago and for the New York Department of Education.

Dr. Fowler has been a member of the American Education Finance Association since 1977, and was elected to its Board of Directors in 1992. He is a coauthor of *Disparities in Public School Spending*, 1989–90, and a coeditor of *Organizational Influences on Educational Productivity*, published by the JAI Press. In addition, he serves on the editorial board of the *Journal of Education Finance*. Dr. Fowler obtained his doctorate in education from Columbia University in 1977.

Introduction and Overview

William J. Fowler, Jr.
National Center for Education Statistics

Disparity in public school district funding is often thought of in terms of the range of expenditures throughout a state, or the difference in expenditures between rich and poor school districts. In at least half the states in the nation, these expenditure differences alone have brought challenges to the constitutionality of state education aid to school districts, and the outcome of this litigation is often court-ordered education finance equalization. Expenditure disparities, however, are seldom the only example of inequitable education financing. There may also be disparities in student access to services and programs. This may be especially true for students in certain residential locations, or those who have been racially or economically segregated. Race and poverty may all influence a student's curriculum through course selection. All of these disparities focus on the child. However, a recent development is to examine the resource allocation to schools, and the equity and effectiveness of school-based funding, which may dramatically influence the resources a child receives.

Although it may seem peripheral to questions of equity, another central concern is the productivity of the entire national public education system. If the system is becoming less productive and efficient, and simultaneously engenders inequity, then simply correcting inequity will not be sufficient.

The presenters at the 1996 National Center for Education Statistics (NCES) Summer Conference sought to deal with the perplexing persistence of inequity, not only in expenditures at the school district level, but also at the school level, and in student access to services, programs and course offerings. Participants also dealt with the question of the efficacy and productivity of public elementary and secondary education.

In the first presentation, **Wayne Riddle and Liane White** of the Congressional Research Service, Library of Congress, examined the nature of expenditure disparities within states. Public elementary and secondary education is dependent upon the wealth of local and state governments, and since their creation, there have been extensive differences in school districts' ability to raise revenue, and subsequent expenditures. Although the importance of these

differences in expenditures, and their relationship to student outcomes continues to be disputed, a recent development has been whether these spending variations should be a Federal concern. Since 1973, when the U.S. Supreme Court decided, in *San Antonio Independent School District v. Rodriguez* that intra-state disparities did not violate the U.S. Constitution, Federal mandates to action in remedying these inequalities would seem an unjustified Federal intrusion upon state responsibilities. The Rodriguez case was decided by the Justices being satisfied that the differences were an incidental byproduct of a conscious and legitimate state action to preserve local control of public schooling. Litigation involving intra-state expenditure disparities then moved to the state courts.

The Federal quiescence regarding state spending disparities has recently been stirred by the passage of a congressionally-mandated study of school finance by the National Academy of Sciences, and by a recently authorized (but not funded) equity provision for the program of education for the disadvantaged (Title I). Another unfunded provision of Federal education legislation provided technical assistance to states for the development of plans to increase school finance equity.

Riddle and White, using NCES data, turn to an analysis of the range of public education expenditures per pupil within states. Despite an NCES report that employs experimental geographic and student need adjustments to expenditures per pupil (Parrish, Matsumoto, and Fowler, 1995), Riddle and White choose to examine nominal expenditures, using a measure of inequality termed the "coefficient of variation" (COV). The COV is the standard deviation divided by the mean, which standardizes the measure across states. The higher the COV, the greater the disparity in spending. One advantage of the COV, in contrast to simply comparing the highest and lowest expenditures in a state (the range), is that the COV considers the expenditures of all the school districts in a state. Unfortunately, because it uses the mean (the average expenditure), it can be influenced by a few outliers, that is, very high or low spending school districts. For this reason, researchers often examine only those school districts that fall between the top and bottom five percent of the school districts in the state (the 95th and 5th percentiles). Riddle and White also acknowledge differences in school district organization. Some states have "unified" school districts, serving grades pre-k–12, while others have elementary and secondary school districts. These organizational differences are not trivial when attempting to assess spending equity.

Riddle and White rank the states on the COV, and list the states with the highest and lowest COV. They conclude that while all of the high COV states have been the subject of litigation challenging the equity of the state elementary and secondary education funding system, there have also been challenges to the constitutionality of five of the eleven lowest COV-ranged states. In addition, there does not seem to be a relationship between the COV and the decisions of State supreme courts in deciding the constitutionality of the State education funding system. For example, New York and Illinois have high COV's, but have not been overturned, while Rhode Island was declared unconstitutional, although it had one of the lowest COV's.

David Monk, **Brian Brent**, and **Christopher Roellke** use a combination of state collected data and case study data to examine resource allocation patterns among school districts in New York State. Particular attention is paid to the distribution of teaching resources across secondary school subject areas. This work addresses recent interest in tracing resource flows to more micro-levels of the schooling system. Recent litigation in Los Angeles, for example, focused on inequalities within the same district. The final settlement (arrived at by agreement of the parties), called for the school district to provide all students with maximum access to teachers with experience and training, limiting revenues to each school to an equal dollar amount per pupil (within $100).

Monk, Brent, and Roellke examine the origination, disposition, and utilization of education resources in relation to school district spending, size, and wealth. Since more than one-third of the pupils in the state reside in New York City, the authors provide separate results for the "Big Five" (New York City, Buffalo, Rochester, Syracuse, and Yonkers). They find that the majority of revenues for education in the state are derived from local sources (56 percent), with the local property tax accounting for nearly half of the total revenue in non-city districts. They examine full-time equivalent (FTE) staffing levels per 1,000 pupils and find the big cities have much lower levels of certified professional staff and higher levels of subject-level administration. Longitudinally, staffing for foreign language and special education has grown, while staffing for English and vocational education has declined. As spending and district wealth increases, staffing of remedial courses declines, and advanced and rigorous curricular offerings grow. This pattern has persisted over time.

The final section of the paper reports on a series of case studies designed to complement the empirical analyses using state collected data. Instructional costs per pupil are calculated for each curricular program area in six school sites. They find that poor districts spend significantly less on math than their wealthier counterparts. Across all schools, either foreign language or science have the highest instructional costs per pupil of the core program areas. Physical education and health consistently spend the lowest amount per pupil on instructional costs. When program instructional costs are expressed as a percent of total instructional costs, the resources devoted to specific areas of the curriculum are quite similar across schools. This suggests that, while the size of the school district's pool of resources may vary among school districts, school systems assign similar priorities to program types when dividing this pool.

Nicola A. Alexander, while at the State University of New York-Albany, sought to track the course selection that students from different racial and economic conditions have made over time. Alexander examined course selection at the school level in grades 9–12 in New York State for twenty years, from 1974–75 to 1994–95, focusing on the courses traditionally associated with a core curriculum: language arts (English, reading, and limited English proficiency); foreign languages; mathematics; science; and social studies. She anticipated that schools with high minority populations and/or large numbers of students with free or reduced-price lunches would have fewer student class periods devoted to a core or advanced curriculum than their "whiter" or more wealthy counterparts.

Alexander finds that the average number of student class periods per week devoted to the core has increased substantially over the past twenty years, with the most dramatic change taking place in special education. The time allotted to English has remained about the same, but mathematics and science class periods have increased. More class periods are being devoted to advanced and Regents courses, and fewer to remedial course work. Surprisingly, poor minority students do not differ in their course taking from their richer, "whiter" counterparts. However, this was only true until 1985, when a dramatic reversal appeared. Investigating further through the use of regression analysis, Alexander finds the smaller the school size and the higher the portion of minority students, the fewer student class periods are devoted to core curriculum and advanced courses. She concludes that if additional courses do not have a substantial effect on educational or labor outcomes, then requiring mastery of the core curricula is an appropriate policy.

After the U.S. Supreme Court failed, in 1973, to find that school district spending inequities violated the U.S. Constitution, litigation moved to the state courts. Since then, approximately 28 State Supreme Courts have ruled on the equity of their education funding systems under their State Constitutions. Professor **Douglas S. Reed** of Georgetown University informs us that of these 28 cases, 12 State Supreme Courts have ruled for the plaintiffs, in favor of more equitable funding, and 16 have ruled for retaining the status quo. He seeks to examine the impact on the

actual distributions of school funds within four states (Connecticut, New Jersey, Texas, and Kentucky) where the State Supreme Court decided favorably for the plaintiffs. Moreover, he analyzes polling results and voting returns, in order to judge public reaction to the Courts' decisions. Particularly, he is interested in whether opposition to equalization comes from economic self-interest, or ideological and racial opposition.

Reed organizes his paper in the following way: section one presents a quantitative assessment of the effects that Connecticut, New Jersey, Texas, and Kentucky Supreme Courts have had on the equality of school finance expenditures; section two examines the public opposition to the education finance reforms that followed the declaration of unconstitutionality of the state education aid systems in New Jersey and Texas; section three concludes by assessing the limitations of state courts and state legislatures in fashioning publically-popular remedies to such court decisions.

Using the coefficient of variation (COV), which standardizes the comparison of inequity between the states, Reed concludes that Connecticut saw only a small decline in inequity, followed by worsening inequity within six years. Texas also showed a very slight decline in the level of inequity. However, New Jersey demonstrated a substantial decline in inequity, and Kentucky almost halved its inequities over four years. In part, the public opposition to greater fiscal equity in Texas and New Jersey may be a product of the changes wrought by the New Jersey and Texas legislators' response to their Supreme Court decisions.

Employing a sophisticated logit statistical procedure, Reed concludes that whites and non-whites in New Jersey perceive differently school finance reform, depending on whether they have children. Economic self-interest governs those respondents without children, while race shapes those with children. Perceived loss of state education aid for one's school district and higher education tax rates were statistically significant. If a respondent thought his property taxes would rise, support for the education finance reform legislation (QEA) dropped by 25 percent. Lower state education aid lessened respondent support by 15 percent. A white parent of a child enrolled in public schools was 33 percent less likely to approve of QEA, even more so if the parent resided in an urban school district. In Texas, the state legislature passed a constitutional amendment to recapture local property taxes, only to see the measure soundly defeated at the polls (63 to 27 percent). Analyzing demographic data and election returns from 150 state polling districts, using a regression analysis, Reed finds that it is not the affluent who opposed the constitutional amendment, but rather those ideologically approving of the conservative Republican U.S. Senate candidate Kay Bailey Hutchinson. Presence of Hispanic residents was a very strong and reliable predictor of support for the amendment.

Reed concludes that although State Supreme Courts can effectively bring about education finance reform through State Legislatures' responses to their decisions, public opposition may occur, and the success or failure of the courts' efforts to improve equity may hinge on the willingness and ability of the State Legislatures' to withstand public opposition to the reform legislation. Although some courts can (and have) threatened to use injunctions to achieve results, the more common outcome is for the legislature to enact reform legislation that is publicly palatable. Racial division and economic self-interest may prevent public acceptance of legislated reforms.

Although a few states, such as Ohio and Texas, have started to move to reporting revenues and expenditures at the school-level, most states do not have such systems in place. New Zealand and the United Kingdom, however, are able to report the finances of every school, and the state of Victoria, Australia, permits site-based management to determine the use of funds at the school level. **Brian J. Caldwell**, a Professor and Head, Department of Education Policy and Management at the University of Melbourne discusses the radical decentralization

since 1993 from a theoretical view, while in another paper, **Peter W. Hill**, a Professor and Deputy Dean of Education also at the University of Melbourne, discusses school-based funding models.

Caldwell explains that the creation of a system of 1,700 self-managing schools occurred at the same time as down-sizing of central and regional agencies. School attendance is "de-zoned" and school councils have the power to set policy and approve budgets. About 90 percent of the state's education budget is decentralized to schools which have the capacity to select their own staff. This occurs within a state-wide curriculum and standards framework and comprehensive accountability requirements. Under the previous centralized system, schools were allocated resources on a uniform formula basis with minimal local discretion. Under decentralized arrangements, a school's "global" allocation is determined by a range of student needs based factors, including a school index of students at educational risk. Under consideration is an increase in weighting for resourcing elementary schools, which are currently under-resourced in relation to secondary schools. There is promising opinion-based evidence that student outcomes have improved.

Hill explains some of the contextual detail of the Australian system. The main source of funds for public education in Australia is income tax collected at the federal level, and re-distributed to the state governments. More than 29 percent of Australian students attend non-government schools, which also receive substantial government funds, but still less than government schools. Of the total expenditure on school education, 95 percent is at the school level. Of this 95 percent, 8 percent are recurrent funds, such as busing, welfare allowance, substitute teachers, or certain support services, such as speech and psychological services. These funds are not considered discretionary, leaving 87 percent of the funds to be used at the school site level by school councils. The formula used to allocate funds to schools includes adjustments for size, student need, rurality and isolation, and priority programs, (such as teacher professional development). The recent radical reforms are really the result of more than two decades of incremental change that has given schools (and school councils) increasing autonomy and accountability, which now includes budgeting and staffing.

Most finance reporting in education does nothing to adjust the revenues and expenditures for either differences in geographic location, or inflation over time (termed "nominal" revenues or expenditures). The development of geographic cost adjustments appeared in the report titled, *Developments in School Finance, 1996*. At the July 1996 Summer Conference one of the most controversial issues was how to deflate education expenditures over time (termed "real" revenues or expenditures), and how to interpret the results of the adjusted figures for assessing educational productivity. **Richard Rothstein and Lawrence Mishel**, of the Economic Policy Institute, explore the problem of making proper inflation adjustments as a basis for assessing educational productivity. How one views educational productivity may vastly influence one's willingness to provide additional tax revenues for public education.

Rothstein and Mishel note that in the last quarter century, government spending jumped from 26 to 31 percent of the gross domestic product,

> ...while schools are not noticeably better, police protection has apparently declined, mail is delivered less often, streets are dirtier, and roads have deteriorated. This apparent conflict between rising public expenditures and declining quality of public service may be one of the causes of the resistance to taxation which increasingly affects public decisionmaking.

However, Rothstein and Mishel suggest that this conflict may be more apparent than real. In an earlier work by Rothstein and Miles (1995), an interesting argument was made that we should expect inflation in

school spending to be higher than inflation shown by the Consumer Price Index (CPI), and Rothstein and Miles used a modified version of the "services" subcomponent of the (CPI) published by the Bureau of Labor Statistics (BLS). Rothstein and Mishel criticize those who use the gross domestic price deflator, or the CPI to convert nominal dollar expenditures to real dollar expenditures. They argue that education is an inherently low productivity-growth industry, and does not face an average inflation rate. Rather, they suggest, education should be compared to other services, which also show low productivity-growth (such as health care). Choosing an inflation rate makes a large difference in the measurement of school spending over time. For example, using the Rothstein and Miles approach, rather than the CPI, education spending from 1967–1991 grew by 40 percent less than it did using the CPI.

Rothstein and Mishel argue that more spending is required in education simply to keep the same real resources available to students. Comparing education and computers, the cost of delivering education services has increased relatively rapidly, while the cost of computers has declined (even while computers have greater quality and ability). In addition, they argue that education is not best measured by examining changes in the prices of education inputs, such as teachers and textbooks. Rather, they assert that one wishes to measure the "value-added" by education. This is more difficult in education than in manufacturing, where the value of the cost of inputs is subtracted from the value of shipments.

They insist that price increases reflect "inflation" if the price increases do not result from either new resources or higher quality. Rothstein and Mishel suggest that if school administrators decide to pay teachers at higher rates (for example, to attract higher quality teachers), this higher cost should not be attributed to inflation. But if they must pay higher salaries to attract a constant quality of teachers because the salaries of other college-educated workers are going up, this is an inflationary cost. Rothstein and Mishel argue that we can't know whether a teacher salary increase should be attributed to inflation or to district choice without examining the trends in salaries of comparable professional workers outside education. They assert that, if we examine education costs alone, we can be misled into confusing inflation with real cost increases because of market imperfections in education. They comment that Chambers and Fowler (1995) find that teacher salaries are lower where large percentages of teachers in a county are employed by a few large districts. This is the result of monopsonistic power, that is, a large district is able to set the salary guide for an area. Rothstein and Mishel then argue for an index that represents the salaries of all college graduates in a region who are substitutable for teachers, rather than a specific education price index. They then argue that it is not meaningful to deflate the input by an education specific deflator, and that their "net services index" (NSI) should be extended and made more generally available.

They argue the NSI is preferable to a specific education price index, because it does not require the complexity of the efforts of, for example, Chambers and Fowler, and because such a task is simply not possible for historical data. Second, they argue that the problems of inflation affect not only education, but other similar human services, such as health, child welfare, and law enforcement. Thus, the NSI could become a single human services index.

An education finance economist, **Eric A. Hanushek** of the University of Rochester, examines the arguments of Rothstein and Mishel and believes their evidence conclusively supports a productivity collapse in schools. Hanushek observes that although the lack of a discernable improvement in student achievement with increased spending suggests a significant productivity collapse. Moreover, the magnitude of the collapse exceeds that in other low productivity sectors of the economy.

Hanushek believes that increases in education spending should be judged in comparison with price increases in service industries. Schools have had

larger spending increases than those for the service sector. This implies that productivity in schools has declined compared to the service sector, which has very low improvements in productivity. Measurement of productivity in education is actually easier than the service sector, Hanushek asserts, where in the service industry, measurement of output is very difficult.

The "basic building blocks" for assessing productivity trends in schools are data on spending, resources, and student performance. In 1965 current spending per pupil was $538. By 1990, it was $5,258. In 1965, the pupil-teacher ratio was 24.1, and the percent of teachers with a master's degree was 23.1. In 1990, the pupil-teacher ratio was 17.3, and the percent of teachers with a master's degree was 52.6. What Hanushek explains is that these changes were accompanied by roughly the same student achievement outcomes, causing much of the discussion about productivity and costs to become confused. Turning to basic considerations of costs, Hanushek elaborates that if widget producers devise a better way of producing widgets, so that more widgets can be produced with fewer workers (like autos which are constructed, in part, by robots), the price of widgets will tend to increase less rapidly than the salaries paid to widget workers. Assuming that the quality of the widgets remains the same (or increases), a widget productivity index would increase. Hanushek argues that while it is often assumed that measurement is easier for goods in the economy as opposed to services, the availability of direct measures of quality in some service sectors (including education) provide significant advantages for the measurement of price and productivity change.

Economic work centering on the cost implications of differential technological change has shown that technologically stagnant work sectors, such as the services industry, where the nature of production may prevent rapid improvements in the production function, face increases in the prices of outputs. The inability to improve the production process may arise from some necessity to maintain perceived quality, say, because the input quantity is related to perceived quality (e.g. smaller class sizes). If labor costs increase, these imply increased costs in the stagnant industries, a situation termed "Baumol's disease." The industries where labor services predominate such as the government, the arts, and nonprofit groups are all subject to this "disease."

Hanushek examines how the price of schooling has grown relative to other prices in the economy, comparing 1982–91. Expenditure per student increased by 7.6 percent annually, while the general price level increased by either 3.7 percent (GDP deflator) or 3.9 percent (CPI). Thus, the price of schooling relative to all other goods in the economy rose by close to 4 percent a year, implying that school productivity lagged those in the general sector by 4 percent a year. Alternatively, examining the changes in average wages for college-educated workers age 25–35, Hanushek concludes that productivity in schools has fallen by 2.5–3 percent per year. Indeed, comparing education to other low-productivity sectors of the economy confirms that education has been doing significantly worse than the typical low productivity industry.

Hanushek concludes that schools systematically hired more teachers, exacerbating "Baumol's disease." The increased proportions of students receiving special education services (something both Rothstein and Hanushek agree on), may explain some of the productivity collapse, but not the extent of the observed decline. One possibility is that students may be becoming more expensive to educate, but the evidence (Grissmer et al., 1994), suggests the opposite. Rather, Hanushek argues, the structure of schools does not provide incentives to improve student performance or to conserve on costs. This lack of incentives is probably the most significant factor in the productivity collapse of schools.

In the final paper, **Dan D. Goldhaber** of the CNA Corporation and **Dominic J. Brewer** of RAND seek to explain the inconsistent findings of researchers with respect to educational resources, particularly

teachers. They utilize an NCES data set, the National Educational Longitudinal Study of 1988 (NELS:88). NELS:88 is a nationally-representative survey of about 24,000 eighth-grade students, with about 18,000 re-surveyed in the tenth grade. NELS:88 links specific students to specific classes and teachers. This linkage ameliorates problems that may arise from using data aggregated to the school-level, and permits exploration of the effect of subject-specific teacher degree levels on student achievement. The teacher and class data in NELS:88 are organized by four school subjects (math, science, English, and history), in such a way that separate information is available about the teachers in each of the four subject areas sampled. Goldhaber and Brewer confine their study to public schools (fearing that private school students may be significantly different from students in public schools).

Goldhaber and Brewer find that although virtually all teachers in public schools have at least an undergraduate degree, only about 70 percent of teachers have a B.A. in their subject area. A lower proportion of math and science teachers have B.A. degrees in their subject area than English and history teachers. Although about half of all teachers have a M.A., less than a quarter are in the subject area they are teaching. Interestingly, a much higher proportion of female teachers teach English than the other three subjects. Goldhaber and Brewer find the usual results, that is, class size, teacher experience, and the percentage of teachers with a M.A. degree are statistically non-significant for students' achievement in each of the four subjects. However, when they examine teacher subject-specific training in math and science, they find that teacher training in the appropriate subject has a significant impact on student test scores in those subjects.

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Expenditures in Public School Districts: Estimates of Disparities and Analysis of Their Causes

Wayne Riddle
Liane White
Congressional Research Service
Washington, DC

About the Authors

Wayne Riddle is a Specialist in Education Finance in the Education and Public Welfare (EPW) Division, Congressional Research Service (CRS), of the Library of Congress. Mr. Riddle's areas of specialization include education for the disadvantaged, elementary and secondary education finance, education governance and intergovernmental relations, international and comparative education, elementary and secondary education reform, and libraries. He has a Bachelor's Degree in History from the University of Virginia, and a Master's Degree in Economics from George Washington University. Mr. Riddle's publications include a wide variety of CRS reports for the Congress, as well as articles, book chapters, etc., published by the American Education Finance Association and similar organizations.

Ms. White was employed as a Technical Information Specialist at the CRS from 1991–96. She received a Masters of Public Administration from American University in 1995 and has a Bachelor of Arts Degree in Economics and Government. Currently, she is working as a Research Specialist at Cornell University.

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Introduction

There has always been substantial variation in revenues and expenditures per pupil for public elementary and secondary education among the local educational agencies (LEAs) of almost every state, as well as among the states. Public school finance is primarily a state and local government function, and localities and states vary widely in their ability and willingness to raise revenues for this purpose. Further, while states generally subsidize LEAs in ways intended to at least partially equalize fiscal resources among them, states and the Federal Government also provide additional funds on behalf of high-needs pupils, such as the disabled, with results intended to better match resources with pupil needs, even though this may increase simple measures of disparity in expenditures per pupil.

There is continuing debate over the importance of these revenue and expenditure variations. While some believe that states have an obligation to provide substantially equal educational resources to all pupils, regardless of the locality in which they live, primarily on the basis of general concepts of equity or fairness, others believe that local educational expenditure variations are significant only if they are substantially associated with differences in academic achievement or other important educational outcomes. There are unresolved disputes over the relationships between expenditure variations and pupil academic achievement or other desired educational outcomes. Some individuals have interpreted the available research on the relationship between education expenditures and pupil achievement as indicating that the relationship is weak, that spending has little effect on achievement,

NOTE: This is an abbreviated version of the Congressional Research Service Report for Congress of the same title, dated December 19, 1995. The CRS report includes discussion and analysis of the general structure of state school finance systems, and of the value, meaning, and significance of school finance "equalization."

or at least little effect in comparison to the effects of such factors as pupil family background. In contrast, others argue that the primary weakness is with the design of most existing research on the relationships between education spending and pupil achievement, and that the few well-designed studies show these relationships to be both statistically significant and substantial.

Second, whatever the inherent significance of spending variations with respect to pupil outcomes, there is ongoing debate over whether this should be a Federal concern. One position is that school finance equity is an issue of concern and responsibility for the states, but not the Federal Government. The Federal financial contribution to elementary and secondary education revenues has always been relatively marginal, and has become more so in recent years. According to the U.S. Department of Education (1995) the Federal share of revenues for public elementary and secondary education has declined from 9.8 percent in 1979–80 to 6.9 percent in 1992–93. Further, in 1973, the U.S. Supreme Court decided, in the case of *Rodriguez v. San Antonio Independent School District*, that differences in local expenditures per pupil within a state did not violate the U.S. Constitution, as long as these differences were the result of state actions intended to meet a public purpose, such as increased local control of education that might accompany substantial reliance on local revenue sources. For these and other reasons, some may feel that Federal involvement in state school finance issues would constitute an unjustified intrusion into state responsibilities.

National interest in public elementary and secondary education finance has been spurred by decisions of a number of state supreme courts that school finance systems violate state constitutions...

However, an alternative position is that there is an appropriate, if secondary, role for the Federal Government to play in the evaluation and possible reform of state school finance programs. National interest in public elementary and secondary education finance has been spurred by decisions of a number of state supreme courts that school finance systems violate state constitutions, plus legal challenges to school finance systems in a number of other states. Further, as many of the education reforms adopted in the 1980s and 1990s evolve, especially the emphasis on high standards for curriculum content and pupil performance, increased concern has been expressed about the ability of LEAs to pay for many of the recommended, or even mandated, changes in their schools. There is also a long-standing national interest in promoting equality of educational opportunities, both within and among the states.

Current Federal involvement in elementary and secondary school finance issues, especially those related to local spending disparities, consists primarily of:

- collection of finance data by the National Center for Education Statistics (NCES), of the U.S. Department of Education, and the Bureau of the Census, at a state level and for large (enrollment of 15,000 or more) LEAs each year, and for all LEAs every second year and seventh year of a decade;
- analyses of school finance-related issues supported by the NCES and other branches of the Office of Educational Research and Improvement (OERI);
- a current, congressionally-mandated study of school finance by the National Academy of Sciences;[1]

[1] The FY1995 appropriations act for the Department of Education and other agencies, Public Law (P.L. 103-333) provided $3.2 million to be available until expended for "school finance equalization research".

- a recently authorized (the Improving America's Schools Act, Public Law (P.L.) 103-382), but thus far not funded, Education Finance Incentive Grant Formula for the program of education for the disadvantaged, Title I, Elementary and Secondary Education Act[2] (ESEA); and

- a provision of the Goals 2000: Educate America Act (P.L. 103-227) which authorizes the U.S. Department of Education to provide technical assistance to states for the development of plans to increase school finance equity (Sec. 313—no funds have yet been specifically appropriated for this purpose).

Thus, the current Federal role is limited to data gathering and analysis, with authorization of a grant formula that would reward states with low disparities in their school finance programs, but no actual appropriation of funds for this formula.

What is the Range in Expenditures Per Pupil for Public Elementary and Secondary Education in the United States?

Sources of Data and Their Limitations

Every second year NCES, in conjunction with the Census Bureau, collects and disseminates financial data for each of the Nation's LEAs.

Every second year NCES, in conjunction with the Census Bureau, collects and disseminates financial data for each of the Nation's LEAs. This is the only current source of expenditure data that includes all LEAs in all states. The only other sources of such data are individual states or LEAs, and those data are neither comprehensive nor necessarily comparable across LEAs and states.

However, there are several limitations or **disadvantages** to using these NCES/Census data to estimate variations in expenditures per pupil among LEAs in the states. These are primarily elements that it would be desirable to take into account in the calculation of disparity statistics, but adequate data are not available. The main effect of these limitations is to make analysis of the reasons for, and significance of, disparity calculations more difficult. Major limitations to the NCES/Census expenditure data, and our calculations of expenditure disparities among each state's LEAs that are based upon these data, are listed.

- These calculations do not adjust for differences among LEAs in **pupil needs**, which in many cases are recognized by categorical state and Federal aid programs that provide additional funds to LEAs with high proportions of special needs pupils. For example, expenditures per pupil might be relatively high in an LEA because it has high numbers of disabled, limited English-proficient (LEP), or poor children. There might also be additional costs associated with population sparsity or density, for which these calculations also do not account. These are among possible reasons for expenditure disparities that most analysts would generally consider to be legitimate. While data are available from which some adjustments based on some groups of high needs pupils could be made—for example, 1990 Census data are available on the number of poor school-aged children living in (although not necessarily attending public school in) LEAs—these adjustments would be imprecise and arbitrary, and may not include all of the categories of high needs pupils actually addressed in different state finance systems.

- There are significant differences among LEAs in most states in the **costs** of providing educational services. In particular, salaries for teachers and other staff vary widely among LEAs in many

[2] See White (1995).

states. While salary variations might partially reflect differences in teacher "quality", they are also influenced by such factors as overall labor supply and demand conditions in each area, average experience of the LEA's teachers, general living costs, or the extent and effectiveness of teacher unions. These factors are not reflected in the analysis in this report.

- There are certain potential **accounting** problems with the data. For example, State government expenditures for teacher retirement that are not passed through LEAs are excluded. Only expenditures for **current operations** are included in table 1, not other expenditures such as capital expenditures for school construction, etc. There may be significant, unresolved differences in accounting for expenditures by different states and LEAs; e.g., differences in accounting for expenditures as "current" versus "capital," or as "elementary and secondary education" versus "adult education". There may also be significant differences in state and local accounting periods.

- All of these data apply to the 1991–92 school year. Significant changes may have occurred in the disparity of expenditures per pupil among LEAs in a state since that time. Changes may also have occurred in LEA boundaries or structure since 1991–92.

The primary advantage of the COV is that it takes into account the expenditure levels of all of the LEAs in each state....

Variation in Expenditures Per Pupil within States—Coefficient of Variation

The measure of expenditure disparity shown in table 1 is the **coefficient of variation** (COV) for expenditures per pupil among the LEAs of each state. The primary advantage of the COV is that it takes into account the expenditure levels of **all** of the LEAs in each state[1], rather than only extreme cases of the highest- and lowest-expenditure LEAs. The COV also has the advantage of relating variation among a state's LEAs to the overall average expenditure per pupil in that state, thereby adjusting for the fact that because state average expenditures per pupil vary widely, an average variation of, for example, $500 per pupil would be much more significant in a low-spending state than in one with high average expenditures per pupil. However, the disadvantage of the COV is that it is relatively complex and the meaning may not be intuitively obvious.

The coefficient of variation of a distribution of numbers—such as the average expenditures per pupil for LEAs in a state—is defined as the "standard deviation" of these numbers divided by the mean, or average. The *standard deviation* is the "average" variation from their mean of a distribution of numbers. More specifically, the standard deviation is the "absolute value" of the average variation from the mean (i.e. numbers both above and below the mean are treated as positive numbers). This is accomplished by first squaring the differences from the mean and adding them, which is equal to the "variance," then taking the positive square root of the resulting number. The standard deviation has the advantage of being a measure of variation that takes all cases into account. However, the standard deviation has the disadvantage of indicating only the average dispersion from the mean, while the value of the mean itself may vary widely for different distributions. This is applicable to average expenditures per pupil, which are much higher for some states than others.

The coefficient of variation adjusts for these differences in the statewide average per pupil expendi-

[1] In this case, all LEAs in the state that meet minimum enrollment size thresholds.

Table 1.—Data on school expenditure variations in the states, 1991–92

State	LEA type	Coefficient of variation	Range between the 5th and 95th percentile (in dollars)
Alabama	unified	11.8	1,255
Alaska	unified	38.1	7,657
Arizona	elementary	12.8	1,188
	secondary	18.4	2,306
	unified	15.5	2,078
Arkansas	unified	13.7	2,078
California	elementary	43.0	1,472
	secondary	12.8	2,057
	unified	12.0	1,392
Colorado	unified	12.0	1,788
Connecticut	unified	12.9	3,239
Delaware	unified	6.0	994
Florida	unified	8.4	1,186
Georgia	unified	17.3	2,845
Idaho	unified	13.8	1,499
Illinois	elementary	27.4	4,017
	secondary	28.2	6,795
	unified	15.9	1,776
Indiana	unified	14.6	1,808
Iowa	unified	8.3	1,176
Kansas	unified	13.7	2,107
Kentucky	unified	11.6	1,293
Louisiana	unified	12.1	1,499
Maine	elementary	20.8	3,513
	secondary	5.6	1,035
	unified	11.7	2,333
Maryland	unified	13.0	2,472
Massachusetts	unified	21.9	3,545
Michigan	unified	20.7	3,368
Minnesota	unified	15.0	2,738
Mississippi	unified	11.4	1,058
Missouri	unified	34.0	4,876
Montana	elementary	19.1	2,191
	secondary	18.6	2,975
	unified	11.4	963
Nebraska	unified	14.3	1,981
Nevada	unified	9.0	583
New Hampshire	elementary	20.6	3,464
	secondary	12.2	2,220
	unified	14.9	2,326

Table 1.—Data on school expenditure variations in the states, 1991–92, continued

State	LEA type	Coefficient of variation	Range between the 5th and 95th percentile (in dollars)
New Jersey	elementary	17.9	4,182
	secondary	19.7	5,249
	unified	13.5	3,556
New Mexico	unified	14.9	1,808
New York	unified	21.6	5,122
North Carolina	unified	8.9	1,204
North Dakota	unified	15.2	1,545
Ohio	unified	27.4	2,878
Oklahoma	unified	12.6	1,265
Oregon	unified	13.4	2,217
Pennsylvania	unified	18.8	3,933
Rhode Island	unified	8.0	1,755
South Carolina	unified	10.7	1,294
South Dakota	unified	15.2	1,830
Tennessee	unified	16.2	1,491
Texas	unified	12.5	1,500
Utah	unified	12.5	1,142
Vermont	elementary	18.9	3,430
	secondary	17.8	3,333
	unified	16.7	3,812
Virginia	unified	20.3	2,534
Washington	unified	8.9	1,523
West Virginia	unified	5.3	781
Wisconsin	unified	12.5	1,901
Wyoming	unified	15.8	2,572

SOURCE: CRS calculations based on data from an NCES survey of LEA finances for 1991–92.

ture because it is the standard deviation expressed as a percentage of the mean. For example, if the coefficient of variation for a distribution of numbers is 25 percent, then the average variation from the mean for these numbers is equal to 25 percent of the mean. As this percentage increases, the overall dispersion of the numbers on which the coefficient of variation was calculated becomes greater. In this case, the higher the coefficient of variation, the greater is the aggregate disparity in expenditures per pupil among LEAs in a state.

An example might help to illustrate the advantage of using the coefficient of variation as a measure of LEA expenditure disparities. Assume there are two hypothetical states, "Columbia" and "Fredonia," each with six LEAs of equal enrollment size. The distribution of expenditures per pupil among the LEAs of each state is shown in table 2.

For each of these two hypothetical states, the range of expenditures, between the highest and lowest spending LEAs in the state, is the same—$4,000. However, the overall dispersion around the statewide mean is much greater for Fredonia, where all LEA expenditure levels are very high or very low, than for Columbia, where most are near the average. This difference in overall dispersion is reflected in the standard deviation, which is higher for Fredonia ($1,871) than Columbia ($1,159), but this understates the difference in dispersion in the two distributions because it fails to adjust for the substantial difference in average values ($4,533 for Columbia versus $3,533 for Fredonia). The coefficient of variation, which is 53 percent for Fredonia, but much lower—26 percent—for Columbia adjusts for this difference in the statewide mean. Thus, the average variation from the mean is 53 percent (of the mean) for Fredonia's LEAs, and 26 percent for those in Columbia.

Table 1 lists the coefficient of variation among LEAs in each state for 1991–92, based on the NCES/Census data. It also lists a calculation of the **range** in expenditures per pupil between high and low spending LEAs in the state. This range figure is simply the difference, in dollars, between the expenditures per pupil for LEAs at the 5th and 95th percentile (i.e., when LEAs are sorted according to their average expenditures per pupil) in the state. The difference between LEAs at the 5th and 95th percentiles is used instead of the difference between the absolute highest and lowest spending LEAs in the state in an effort to avoid distortions from anomalous, extreme cases. The range figures are provided to help provide context for the discussion of variations; however, because it is a preferable measure of overall expenditure variations, the analysis following table 1 will be based only on the coefficient of variation calculations.

With respect to both the coefficient of variation and the range, expenditure disparity measures are calculated by state and by type of LEA...

With respect to both the coefficient of variation and the range, expenditure disparity measures are calculated by state and by type of LEA: elementary, secondary, or unified (elementary and secondary combined) for states with significant numbers of each type of LEA.[4] LEAs are compared only to those of similar type because costs are generally higher for secondary than for elementary education. Neither the District of Columbia nor Hawaii are included in this analysis because each consists of only one LEA. In addition, limited purpose LEAs, such as those providing only vocational education or education for disabled children, are excluded from the

[4] Because more than 10 percent of the students attend schools in separate (non-unified) school districts, the analysis includes elementary and secondary school districts for the following states: Arizona, California, Illinois, Maine, Montana, New Hampshire, New Jersey, and Vermont.

Table 2.—Measures of disparities in expenditures per pupil in two hypothetical states

LEA	"Columbia"	"Fredonia"
1	$2,500	$1,500
2	$4,400	$1,600
3	$4,500	$1,900
4	$4,600	$5,300
5	$4,700	$5,400
6	$6,500	$5,500
Mean	$4,533	$3,533
Standard deviation	$1,159	$1,871
Range	$4,000	$4,000
Coefficient of variation	**26%**	**53%**

SOURCE: Riddle and White, unpublished tabulations.

calculations, as are small LEAs with enrollment below 200 pupils (to avoid distortions resulting from diseconomies of scale (i.e., increasing costs per pupil when the total number of pupils in a LEA is very low)).

Brief analysis of expenditure disparity data

Keeping in mind the many limitations to the NCES/Census data on which the calculations in table 1 were based, it is nevertheless worthwhile to examine general patterns in these data. Particular attention is given to states that these data indicate have the greatest variations in expenditures per pupil among their LEAs.

Table 3 lists the 10 states with the highest and lowest coefficient of variation for expenditures per pupil among the state's LEAs. For most states, only the unified school districts are used in the analysis. In the two columns of table 3, states are listed in order of their ranking on the coefficient of variation measure—thus, in the first column in table 3, California elementary LEAs had the highest estimated COV, and Michigan unified LEAs the 10th highest.

Figure 1 illustrates the coefficient of variation estimates for the unified schools districts in each state. While the limitations of these data and calculations must be kept in mind, certain states and LEA types appear to have especially high or low disparities in expenditures, as measured by the coefficient of variation. Characteristics that tend to be associated with high-COV states include numerous, relatively small (in terms of both population and geographic size) LEAs; significant proportions of their enrollment in separate (particularly elementary), rather than unified, LEAs; and frequently a relatively low state share of public elementary and secondary education revenues (7 of the 10 in column 1 of table 3 were below average in 1992–93). In contrast, low-COV states tend to have broad-based, usually county-level, LEAs (e.g., such Southeastern states as West Virginia, Florida, North Carolina, and South Carolina); predominantly unified, or at least relatively large secondary, LEAs; and frequently a relatively high state share of public elementary and secondary education revenues (8 of the 11 in column 2 of table 3 were above average in 1992–93).

With respect to state court activities, the school finance systems of all of the high-COV states listed in the first column of table 3 have been challenged in

recent years, although not successfully in all cases. However, there have also been recent state court challenges to the school finance systems in five of the eleven low-COV states listed in column 2 of table 3. Further, there is no close correlation between the estimated COV and the final decisions thus far of state supreme courts on these challenges. Several of the systems in high-COV states have been found to date by State supreme courts to be constitutional (e.g., New York, Illinois), while one of the systems in low-COV states has recently been found by a State supreme court to be unconstitutional (i.e., Rhode Island).[5]

A final note regarding table 3—even after removal of the smallest enrollment LEAs from consideration, Alaska may be a special case with particularly dispersed pupil populations and unusual cost considerations, and therefore its COV estimate may not be comparable to other states.

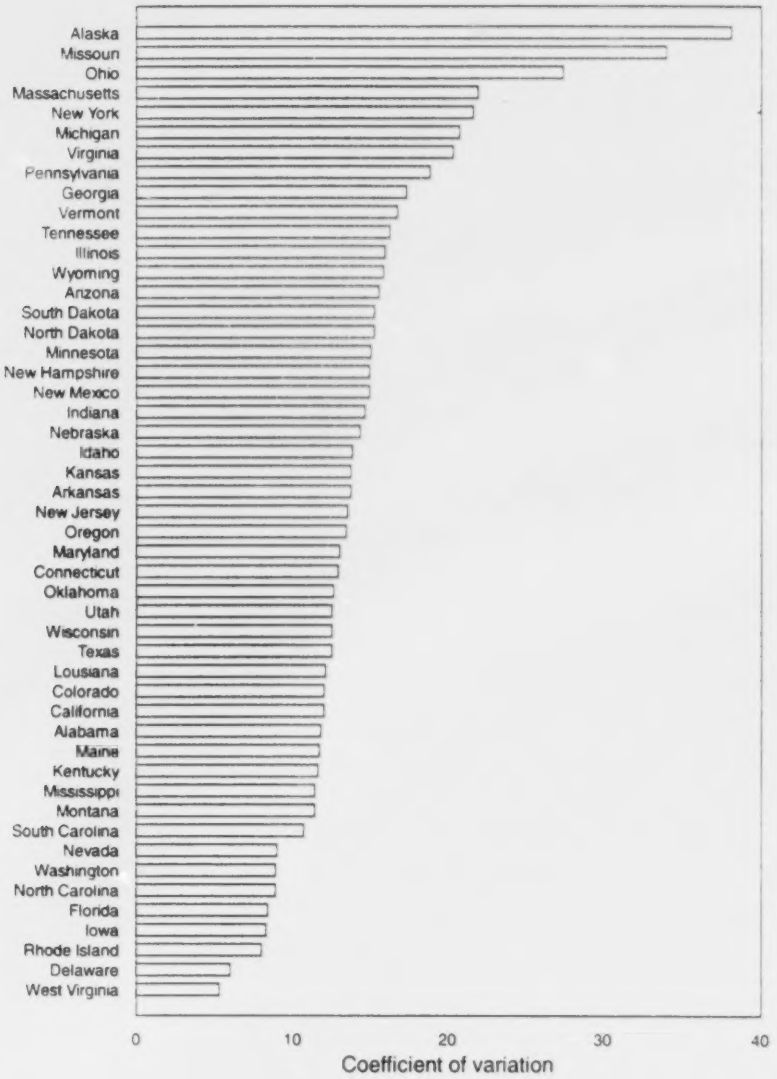
Table 3.—The 10 states with the highest and lowest coefficient of variation in LEA expenditures per pupil

10 state/LEA types with the **highest** coefficient of variation in expenditures per pupil	10 state/LEA types with the **lowest** coefficient of variation in expenditures per pupil
California (elementary) – 43.0	West Virginia (unified) – 5.3
Alaska (unified) – 38.1	Maine (secondary) – 5.6
Missouri (unified) – 34.0	Delaware (unified) – 6.0
Illinois (secondary) – 28.2	Rhode Island (unified) – 8.0
Illinois (elementary) – 27.4	Iowa (unified) – 8.3
Ohio (unified) – 27.4	Florida (unified) – 8.4
Massachusetts (unified) – 21.9	North Carolina (unified) – 8.9
New York (unified) – 21.6	Washington (unified) – 8.9
Maine (elementary) – 20.8	Nevada (unified) – 9.0
Michigan (unified) – 20.7	South Carolina (unified)/ Oregon (secondary) (tie) – 10.7

SOURCE: CRS calculations based on data from an NCES survey of LEA finances for 1991–92.

[5] See for example, National Conference of State Legislatures 1995; The Finance Project 1994; Education Commission of the States 1994; Education Daily 1995.

Figure 1.—Coefficients of variation for expenditures per pupil, by unified LEAs



SOURCE: CRS calculations based on data from NCES survey of LEA finances for 1991–92.

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Teacher Resource Use Within New York State Secondary Schools

David H. Monk
Brian O. Brent
Christopher F. Roellke

About the Authors

David H. Monk is chair of the Department of Education and Professor of Educational Administration at Cornell University. He earned his Ph.D. at the University of Chicago, and has taught in a visiting capacity at the University of Rochester and the University of Burgundy in Dijon, France. Monk is the author of *Educational Finance: An Economic Approach* (1990), as well as numerous articles in scholarly journals. He is a Senior Research Fellow for the Consortium for Policy Research in Education (CPRE) and serves on the editorial boards of *The Economics of Education Review*, *The Journal of Educational Finance*, and *The Journal of Research in Rural Education*. He recently chaired the technical study group appointed by the New York State Board of Regents to examine alternative revenue sources for New York State public schools. He consults widely on matters related to educational productivity and the organizational structuring of schools and school districts and is a past president of the American Educational Finance Association.

Brian O. Brent is an Assistant Professor of Educational Leadership in the Warner Graduate School of Education and Human Development at the University of Rochester. He earned his Ph.D. at Cornell University. Professor Brent is a Certified Public Accountant who also holds a Master's Degree in Taxation from Arizona State University. He is interested in revenue issues of public school finance.

Christopher F. Roellke is an Assistant Professor of Education at the University of Richmond, where he teaches educational policy, curriculum theory, and applications of technology to classroom teaching. He was formerly a Research and Teaching Support Specialist at Cornell University and a research assistant for the Consortium for Policy Research in Education (CPRE). His research interests are in the politics and economics of education and secondary school reform. He is the recipient of the 1997 outstanding doctoral dissertation award of the American Education Finance Association (AEFA), The Politics of Education Association (PEA), and Division A of the American Educational Research Association (AERA).

Teacher Resource Use Within New York State Secondary Schools

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Introduction

More conventional research dealing with education finance in general and resource allocation in particular has focused on the raising of revenues at Federal, state, and local levels and the subsequent apportionment of these resources across schooling systems, typically school districts. It is becoming increasingly clear, however, that concerns about both productivity and equity cannot be adequately addressed solely at the district level. The purpose of this paper is to establish the importance of understanding resource flows at micro-levels of educational systems and to report on the progress made in New York to measure these flows. The findings presented here are part of a multi-state effort being made by the Consortium for Policy Research in Education (CPRE) Finance Center to gain insight into the allocation of educational resources at a variety of organizational levels.

This paper begins with an overview of a diverse set of policy debates that has drawn attention to resource allocation patterns at sub-district levels. The relevant policy issues are divided into two categories: productivity concerns and equity concerns. Both of these categories are discussed in detail. This discussion leads to a report on a series of empirical analyses used to gain insight into the allocation of educational resources at a variety of organizational levels.

In the next section, we describe briefly the data and methodology that underlies this line of inquiry. We deal with both the conceptualization of a "resource flow," and the identity of background and

NOTE: CPRE is a consortium of universities and operates two research centers, one of which is focused on matters of educational finance and productivity. The work of the Finance Center is supported by grant #R117G10039 from the U.S. Department of Education, Office of Educational Research and Improvement. The other states that are under examination are California, Florida, and Minnesota. See Picus, Tetretault, and Hertert (1995) and Nakib (1995).

structural features of school systems that are likely to affect internal resource flows.

The third section reports the results of cross sectional and longitudinal analyses of district resource allocation patterns in New York State's public schools for 1991–92. Utilizing data obtained from New York State's Education Department, we examine the allocation and use of professional staff across elementary, secondary, and administrative levels of schooling. Particular attention is given to distribution of both teachers and students to different areas of the curriculum. We also examine trends in the allocation and use of professional staff in school districts with different structural characteristics, including school district size, spending, fiscal capacity, and incidence of poverty.

The fourth section reports findings from a series of case studies that permit us to explore resource allocation phenomenon at more micro-levels than is customary in education finance research. Our quest for more refined measures of instructional resource uses prompted us to develop and apply a micro-level cost allocation model to six secondary schools within four districts in New York State. This model enabled us move beyond aggregated measures of the use of instructional resources and characterize all of the uses to which teachers put their time, including study halls and preparation periods.

Current efforts to understand more about productivity and the use of educational resources are demonstrating the importance of using refined measures of how resources flow within schools and classrooms.

The final section addresses the policy implications of the findings reported in this paper. These analyses all involve the adaptation of personnel data into a resource allocation framework. This adaptation raises a number of interesting data collection issues and these are discussed in conjunction with our findings. The section closes with a discussion of future directions for micro-level resource use inquiry.

Policy Relevance of Teacher Resource Allocation Information

A remarkably diverse set of policy debates has drawn attention to resource allocation at micro-levels of education systems, and we use this section to provide an overview of the kinds of issues that are prompting this attention. The relevant policy issues can be divided into two broad categories: 1) concerns over productivity or efficiency in education; and 2) concerns over equity and adequacy in the distribution of educational opportunities.

Productivity Concerns

Current efforts to understand more about productivity and the use of educational resources are demonstrating the importance of using refined measures of how resources flow within schools and classrooms. For example, there has been a growing awareness of the importance of resources flowing from either parents or peers. Some studies have focused on the direct effects of resources supplied in the home or by peers on pupil performance (Coleman 1988, 1991). Some on-going demonstration projects have also placed emphasis on the importance of parent and peer influences and are reporting successes (Comer 1980, 1988; Levin 1989, 1994). Others have considered home and peer influences in the context of their effects on grouping and tracking decisions within schools (e.g., Gamoran, 1993). In all of these cases, more refined measures of resource flows within schools, and classrooms are being found to have impact on pupil performance.

Similar conclusions are being drawn by researchers dealing with alternative indicators of teacher effectiveness. A common finding in this line of research has been that global measures of teacher education are not dependably related to pupil out-

comes. More recently, researchers have succeeded at disentangling teacher attributes into more refined measures of either what teachers actually know about the subject being taught (Hanushek et al. 1992) or teachers' level of subject area preparation (Monk and King, 1994). The results of these studies are encouraging and suggest that part of the key to understanding more about the effectiveness of teachers and teaching lies in the utilization of more refined measures of what teachers know and are capable of accomplishing in classrooms.

Progress is also being made toward understanding the impact of curriculum on pupil performance through the use of disaggregated data. It has been shown, for example, that high school course taking behavior is related to educational outcomes, and that students who take more advanced courses in a given area perform at higher levels (Meyer 1988; Lee and Bryk, 1988; Gamoran 1987). These studies employ relatively refined measures of the kind of curricular resources that flow directly to students. They are far removed from earlier and largely unsuccessful efforts that measured exposure crudely in terms of the broad measures of how much time students spend in school.

Cooper and Sarrel (1991) have been prominent among those who have attempted to disentangle resource flows at micro-levels so that flows to classrooms and instruction can be isolated from flows to more centralized administrative services.

In addition, the courts have been showing increasing amounts of interest in the effects of differences in district expenditure levels on the actual provision of educational services for students (Benson 1991). The so-called "third wave" litigation has become more prescriptive and has moved well beyond simple dollar valuations of inputs provided at the district level. Both the New Jersey and Kentucky Courts, for example, assessed educational opportunities in fiscal terms, as well as in terms of measures of services and programs available to children.

Finally, district resource allocation flows have also been at the center of recent controversies surrounding alleged mismanagement of educational systems. Cooper and Sarrel (1991) have been prominent among those who have attempted to disentangle resource flows at micro-levels so that flows to classrooms and instruction can be isolated from flows to more centralized administrative services. More recently, the accounting firm of Coopers & Lybrand has joined this effort and there has emerged a Finance Analysis Model (see Speakman et al. 1995; and Coopers & Lybrand, 1995). The goal has been to provide a tool that school officials at the district level can use to understand more about the division of resources across alternative uses.

Equity Concerns

There is a parallel, highly diverse set of policy issues where the goal is to address equity or adequacy problems in the distribution of educational opportunities. Here, also, we find a growing awareness of how important it is to obtain highly detailed measures of resource flows at disaggregated levels.

A Special Commission carried out a study of how internal school district spending practices have evolved in New York between 1979 and 1992 (Lankford and Wyckoff 1993; 1995). While this report dealt with efficiency, as well as equity issues, one of its most striking findings involved the rapid growth that has taken place in the funding of special education relative to other kinds of education. According to Lankford and Wyckoff's results, additional expenditures for disabled students totaled over a third of the increase in real per pupil expenditures between 1980 and 1992 (Lankford and Wyckoff, 1993). The recently released Economic Policy Institute's longitudinal analysis of spending in nine nationally representative school districts between 1967 and 1991 found that their sampled districts spent four percent of total resources

on special education, and that this figure had increased to 18 percent by 1991 (Rothstein with Miles, 1995). Both the Lankford and Wyckoff and the Rothstein studies raise a number of important equity and productivity questions. Their micro level analysis provides much needed empirical evidence for policymakers.

There have also been a number of recent school finance court decisions where the focus has been on equity at levels that are more disaggregated than is customary in school finance litigation. For example, there has been litigation in Los Angeles that focused on inequalities in spending levels among schools within the district (*Rodriguez et al. v. Los Angeles Unified School District et al.*, 1992). The agreement that was finally reached called for the district to: 1) equalize basic norm resources, teacher experience, and teacher training among schools; 2) provide all students with maximum access to teachers with experience and training; and 3) mitigate the consequences of limited teacher experience and training wherever equalization cannot be achieved. In addition, by the 1997–98 school year, all of the regular schools within the district are expected to receive an equal dollar amount per pupil (within $100 per pupil). Beginning in 1992–93, the district must assign the teachers with high levels of training and experience to schools in the lower third of faculty training and experience.

Researchers are also beginning to examine resource inequalities across different areas of the curriculum.

Researchers are also beginning to examine resource inequalities across different areas of the curriculum. Oakes (1990) examined the differential allocation of resources to students within secondary schools, and drew attention to the effects of track placement on students' access to learning opportunities. Monk and Haller (1993) conducted a series of studies of the role school size plays in the allocation of resources to different areas of the secondary school curriculum. They examined divisions across both subject areas (e.g., mathematics versus English) and types of courses (e.g., remedial versus advanced).

Concern over one or another public policy issues coupled with a growing realization that progress in the debate is aided by the availability and use of more refined and less aggregated measures of resource flows connects this highly diverse set of studies on both the efficiency/productivity and equity/adequacy sides of the policy divide. It does not follow that greater disaggregation is always preferable to less, but it does seem clear that moving beyond gross district level depictions of resource uses offers many advantages.

Conceptual Issues and Methodology

Conception of a Resource Flow

We recognize three broad dimensions which resource allocation phenomena in education can be characterized. Specifically, we distinguish among the origination, disposition, and utilization of educational resources. The term "origination" refers to the size and nature of the resource streams that enter schooling systems. In a system of fiscal federalism, ambiguities quickly arise over precisely what point each type of revenue enters (e.g., Federal, state, and local level), but it is clear that the resources enter at different levels and can carry different stipulations. The origin itself can have implications for subsequent decisions that are made about the resources in question. In this paper we do not address issues related to the origination of resources. Detailed discussions of these findings are available in Monk, Roellke, and Brent (1996). The term "disposition" refers to decisions officials at various levels of the system make that allocate resources. For example, a resource might be allocated to the secondary science curricular

area or it might be allocated to a specific grade level within an elementary school. The term "utilization" moves the analysis deeper into the educational system (and closer to the point at which resources are transformed into educational outcomes) by explicitly introducing the allocation of student time and effort. As the discussion below makes clear, the chief difference between the disposition and utilization of resources involves a difference in the type of resource being allocated. Disposition pertains to the allocation of purchased and hired schooling resources while utilization involves the allocation of pupil time and effort and the attendant combination with teacher effort.

Data and Methods

State Collected Data. The general strategy for our analyses was to begin by using state collected data and then move progressively toward more micro-level indicators of resource allocation and use. Thus, there were multiple sources of data for our analyses. First, our analyses began with an examination of data collected by the New York State Education Department (SED) for the 1991–92 school year. For both the cross-sectional and longitudinal analyses we restricted our inquiry to "regular" K–12 school districts in New York by excluding operating institutional school districts, special residential school districts, and those districts operating only an elementary or secondary program. A separate analysis is conducted for the Big 5 city districts (Buffalo, Rochester, Syracuse, Yonkers, and New York City). In addition to being fiscally dependent school districts, these five city districts are substantially larger than all other districts within the state (nearly one-third of the pupils within the state are from New York City alone).

The general strategy for our analyses was to begin by using state collected data and then move progressively toward more micro-level indicators of resource allocation and use.

These exclusions left us with a sample size for the 1991–92 school year of 650 districts. The School Financial Master File (SFMAST), the Institutional Master File (IMF) and the Personnel Master File (PMF) of the Basic Education Data System (BEDS) were used for revenue, expenditure, enrollment, and staffing information. Figures reflecting the percentage of pupils qualifying for free and reduced-price lunch (FRPL), property wealth per pupil, and income per pupil came from the State Education Department's education finance research data base.

Within the core subject areas of the secondary school curriculum, we differentiate between "advanced," "regular," and "remedial" type offerings.[1] We relied on the course titles listed in the assignment code manual of BEDS to determine the type of course offering. We counted, as advanced courses, those subjects described in the manual as "advanced," "honors," "accelerated," or "college-credit." We counted, as remedial, those courses described as: "basic," "remedial," "practical," "developmental," or "corrective" (not special education). In cases in which the type of offering could not be determined by the course title, we relied on teachers' descriptions of the type of pupils within the class. If the teacher reported a homogeneous class of "advanced placement" or "honors" pupils, we counted that offering as advanced. Heterogeneous classes with generic course titles were counted as regular offerings.

In our within school disposition analysis, we report findings in several ways. First, we calculated full-time equivalent teacher staffing levels on a per 1,000 district pupil basis. For example, we calculated the number of full-time-equivalent elementary, secondary, and administrative professional staff per 1,000 pupils in the district. We also calculated the number of full-time-equivalent teachers in specific secondary school subject areas per 1,000 district

[1] We define the core curriculum as English, mathematics, science, social studies, and foreign language.

pupils. These per 1,000 pupil indicators provide insight into the intensity of resources that are made available within the school. We also consider the degree to which these intensities are related to background structural features such as district spending levels, district size, district property wealth, district income wealth, and district performance.

Inequalities in these resource intensities can arise from two sources: 1) there can be differences in the size of the overall pool of resources; or 2) there can be differences in how districts divide a given pool of resources across the various competing sub-units. For example, we might find a large difference in the teacher resources devoted to mathematics in two districts. The difference might be that the two districts have different sized pools of resources to allocate; or, they might have the same pool to work with but decide to divide it in very different ways. Given this interest in internal resource allocation practices, it is important to examine directly the decision to divide the pool of resources in one fashion rather than another. In addition to the staffing level per 1,000 district pupils indicator, we provide the percentage share of the teaching resource pool that specific subject areas receive. This calculation of teacher time excludes consideration of "non-academic" teaching responsibilities such as study hall duty, cafeteria duty, and other unassigned teacher time.

In this report, we have relied upon a ratio of the two percentages as our measure of resource utilization.

To address our interest in the utilization of resources we used class-specific enrollment information to generate a series of subject-specific indicators that tell us the percentage of the pool of student-time resource that is devoted to each area of the curriculum. The numerator in this calculation is total number of students enrolled in specific subject area courses. The denominator in this calculation is the total number of students enrolled in all subject area courses. This excludes "non-academic" allocations of pupil time for study halls, lunch, or otherwise unassigned student time. With these two percentage share indicators in hand (percentage teacher time and percentage pupil time) it becomes possible to generate an index of resource utilization. In this report, we have relied upon a ratio of the two percentages as our measure of resource utilization. The teacher resource share appears in the numerator of the ratio, so a figure of 1.3 for a given subject area suggests that 30 percent more teacher resources than pupil resources are devoted to the subject in question. Thus, low readings on this indicator suggest that the teacher resource in question is facing relatively heavy demands.

Case Study Data. In the next section we present case study findings based on data collected at four districts across New York State. The four districts chosen for this research have been coordinated with the ongoing work of the Finance Center of the Consortium for Policy Research in Education (CPRE). In selecting the districts, CPRE has made efforts to obtain a diverse sample based on district wealth (property value and income per pupil), district enrollment, and state regional representation. Within the two larger districts, a sub-sample of secondary schools was randomly selected for the intra-district analyses.[2]

In the case study analyses we applied a micro-level cost allocation model to six secondary schools within the four case study sites. The first step in the development of a micro-level resource allocation model requires the specification of the unit of analysis. As noted, we are interested in characterizing and applying a dollar metric to all of the uses to which

[2] For detailed descriptions of the sites see Monk, Roellke, and Brent (1996).

teachers put their time. Our unit of analysis, therefore, reflects the various components that comprise direct classroom instruction. Direct classroom instruction can be sub-divided into instruction-regular and instruction-special education. Within these subdivisions the unit of analysis is further disaggregated into instructional programs (e.g., English, history, and art), and again into individual course offerings (e.g., English 9 honors, AP American history, and studio art). By specifying the unit of analysis along these dimensions, the distribution of resources can be measured along a continuum of more refined activities. In the aggregate, the model measures the costs of offering individual program types (e.g., regular/special education). At its most micro-level the model yields information concerning the per pupil cost of offering a specific course at a given site.

The second step in the application of the micro-level resource allocation model requires the allocation of instructional costs to the unit of analysis. Instructional costs are comprised of the salaries, wages, and fringe benefits of personnel whose work can be directly traced to the unit of analysis. To allocate these costs among the unit of analysis, a two-step procedure was employed. First, relying on employee payroll schedules, salaries, wages, and related benefits of those individuals properly classified as instructional costs were aggregated.[3] The result of this process was to generate a schedule which detailed the instructional costs (i.e., actual salary plus benefits) for each of the teachers and teachers' aids in the districts. Next, utilizing staffing data and a master course schedule, instructional costs were assigned to the unit of analysis. In doing so, we were able to measure the instructional costs of a particular course or portion of the curriculum, by applying the actual salaries that were being paid to the teachers and aides involved.

...on average, New York State districts provide roughly comparable teacher/pupil staffing levels for their elementary programs relative to their secondary programs...

Findings Using State Collected Data

The Disposition of Resources

Breakdowns by School Level and Administration. Table 1 provides insight into the disposition of professional staff members' time across various areas of the school district's operations. For example, on average, New York State districts provide roughly comparable teacher/pupil staffing levels for their elementary programs relative to their secondary programs (33.57 professional staff per 1,000 pupils at the elementary level versus 34.59 at the secondary level, including special and vocational education). Administrative positions are staffed at a rate of 10.58 positions per 1,000 pupils. These administrative positions comprise 13.4 percent of all the total staffing investment on the part of the district, but it is important to note that this is a broad administrative category that includes building level administrators. Table 1 clearly indicates that the largest administrative sub-category was special education administration.

Breakdowns by Secondary School Subject Areas. Table 1 also provides insight into the disposition of staffing resources across subject areas within secondary schools. We can see that the investment in the academic area of the curriculum involves 27.57 teachers per 1,000 pupils or 79.71 percent of all teaching resources devoted to the secondary school program (grades 7–12). In contrast, the vocational and special

[3] Benefits include provisions for state retirement, teachers retirement, social security, workmen's compensation, life insurance, disability insurance, dental insurance, employee assistance, hospital insurance, and unemployment reserve.

Table 1.—District-wide instructional and administrative staffing patterns professional staff per 1,000 district pupils: School years 1991–92

Staffing category	State totals*	Big 4 cities**	New York City
Elementary Education			
Elementary regular	29.9	26.8	21.84
Elementary special education	3.67	5.66	4.73
Total elementary instruction	33.57	32.46	26.57
Secondary Education			
English	5.48	4.49	3.67
Mathematics	4.65	4.18	3.52
Social studies	4.19	3.22	2.66
Science	4.23	3.03	2.39
Foreign language	2.55	1.50	1.41
Music and art	2.93	1.89	1.12
Physical education and health	2.56	2.03	1.61
Other academic	0.98	2.18	2.02
Total academic education	27.57	22.52	18.40
Vocational			
Trade	2.28	2.91	1.07
Business	1.17	2.09	3.05
Other vocational	0.34	0.55	0.30
Total vocational education	3.79	5.55	4.42
Special Education			
Resource room	1.29	0.94	1.07
Special classes	1.67	3.65	4.05
ESL	0.16	0.44	0.85
Other special	0.11	0.23	0.32
Total special education	3.23	5.26	6.29
Total secondary education	34.59	33.34	29.11
Central administration	1.18	1.07	0.90
School administration	2.50	4.61	3.24
Special administration	5.36	5.06	4.67
Subject administration	1.54	3.27	3.56
Total district administration	10.58	14.02	12.37
Total professional staffing	78.74	79.85	68.05

* Excluding the Big 5 City districts.
** Buffalo, Rochester, Syracuse, and Yonkers.
SOURCE: Basic Educational Data System (BEDS), New York State Department of Education.

education areas comprise 10.96 percent and 9.34 percent of the teacher resource base, respectively.[4]

In addition, table 1 also provides information about subject specific breakdowns. In particular, we can see that the resource intensities are highest in the English and mathematics areas of the curriculum, 5.48 and 4.65 teachers per 1,000 district pupils, respectively. The figures for social studies and science courses are slightly smaller at 4.19 and 4.23, while the teaching resources devoted to foreign language courses are relatively low at 2.55. Allocations to specialized academic offerings like art and music and physical education and health are on the order of what we see for foreign language instruction.

Comparisons with the Big 5 City Districts. The right hand columns in table 1 permit comparisons between statewide average for the non-Big 5 city school districts in New York with the results for New York City in particular, as well as with the remaining Big 4 city districts (Buffalo, Rochester, Syracuse, and Yonkers). These comparisons reveal some striking differences. In particular, in most areas of the curriculum, the teacher resource intensities in the core academic curriculum are lower in the Big 5 City districts than they are elsewhere in the state. Some of the differences are large and as a general rule the resource intensity levels are lowest in New York City. For example, in English the resource intensity level for New York City is 3.67; the comparable figure for the Big 4 districts is 4.49 and it is 5.48 for the remaining districts in the state. In mathematics the resource intensity level for New York City is 3.52. The analogous number for the Big 4 is 4.18 and for the rest of the State it is 4.65. In science the resource intensity level are 2.39 for New York City, 3.03 for the Big 4, and 4.23 for the rest of the state. The pattern holds for social studies and foreign language allocations.

In English and mathematics, we found that a larger allocation of teacher resources goes to remedial rather than to advanced course offerings.

The administrative staffing intensity measures are also interesting for the cities. Compared with the state as a whole, it is clear that the number of administrators per pupil is higher in the city districts, but most of the extra staffing is found at the school rather than the central level of the administrative structure. In particular, the city districts register relatively high levels of administrative staffing at the building and subject area levels.

Breakdowns between Course Levels. We also examined more refined breakdowns of the core academic areas of instruction. Specifically, we looked separately at advanced and remedial courses in the English, mathematics, social studies, science, and foreign language areas of the curriculum, what we called the core academic curriculum. Table 2 reports these results.

In English and mathematics, we found that a larger allocation of teacher resources goes to remedial rather than to advanced course offerings. More than twice the level of resources goes to remedial relative to advanced offerings in these areas. In English, for the non-Big 5 state averages, the intensities are .86 teachers per 1,000 district pupils for remedial courses compared to .33 for advanced courses; in mathematics, the comparable figures are .96 versus .45. A similar distribution can be found in the Big 5 city districts.

Quite a different pattern can be found in the science, social studies, and foreign language areas of the core academic curriculum. In these areas, larger shares of the teaching resources devoted to the subject

[4] These data measure only vocational and special education courses that are offered directly by the individual school district. Courses offered through regional cooperatives, called BOCES in New York State, are not reflected in these data.

Table 2.—Secondary school (7–12) instructional staffing patterns refined core academic subject area breakdowns professional staff per 1,000 district pupils: School years 1991–92

Staffing category	State totals*	Big 4 cities	New York City
English Total	5.48	4.49	3.67
Advanced	0.33	0.27	0.22
Regular	4.29	3.29	2.70
Remedial	0.86	0.94	0.75
Mathematics Total	4.65	4.18	3.52
Advanced	0.45	0.29	0.23
Regular	3.25	2.70	2.19
Remedial	0.96	1.20	1.10
Social Studies Total	4.19	3.22	2.66
Advanced	0.29	0.30	0.20
Regular	3.81	2.87	2.40
Remedial	0.10	0.05	0.06
Science Total	4.23	3.03	2.39
Advanced	0.34	0.21	0.19
Regular	3.84	2.80	2.17
Remedial	0.05	0.02	0.03
Foreign Language Total	2.55	1.50	1.41
Advanced	0.13	0.11	0.09
Regular	2.42	1.40	1.31
Remedial	0	0	0
Total advanced	1.54	1.18	0.93
Total regular	17.6	13.05	10.78
Total remedial	1.96	2.21	1.94
Total core academic	21.1	16.44	13.65

* Excluding the Big 5 City districts.
NOTE: Figures are weighted by district enrollment.
SOURCE: Basic Educational Data System (BEDS), New York State Department of Education.

in question are allocated to advanced courses. Again, the pattern is the same in the Big 5 city districts.

The bottom of table 2 provides insight into the aggregate division of resources among advanced, regular, and remedial course offerings regardless of the subject being taught. The results indicate a tendency to provide more resources to remedial rather than to advanced offerings. However, it is important to keep in mind that these measures of resource allocation are based on counts of all pupils in the district. The allocation of student time across course types is also relevant and will be considered later when the focus shifts to the utilization of resources.

Breakdowns by Selected District Structural Characteristics. We were also interested in making comparisons among districts on the basis of structural characteristics such as school district fiscal capacity, spending levels, size, and the incidence of students living in poverty. One of the most interesting results of this comparative analysis is the finding that resource intensity levels are remarkably flat across large differences in school district spending levels. More specifically, we found that the number of teachers per 1,000 district pupils remains essentially flat across the first four spending quintiles. It is only among the highest spending districts in the state that we began to find an increase in the number of teachers allocated to subjects on a per pupil basis. This result holds true across all areas of the academic curriculum. This is a new and intriguing result. It suggests that as spending levels rise through the first four quintiles of districts, the additional resources are devoted either to salary increases for existing staff, to other non-personnel uses, or to other areas of the curriculum.

...resource intensity levels are remarkably flat across large differences in school district spending levels.

We also examined the impact of spending levels on the division of resources within a given core academic subject area between advanced and remedial types of courses, and found some interesting results. It is clear that the percentage share of advanced courses increases with spending levels. In other words, higher spending districts tend to devote a larger share of their core curriculum resource base to advanced rather than to remedial offerings. What this suggests is that the students in advanced classes in high spending districts are doubly advantaged. Not only is there a larger base level of resource available to them, but they receive a larger share of the base. For students in remedial classes, being in a high spending district has two conflicting effects. On the one hand, the higher spending districts have higher resource levels. On the other hand, remedial classes receive smaller shares of the resource base in the higher spending districts. On balance, the smaller percentage share is the dominating effect such that the absolute level of teacher resources is lower for the students in the remedial classes in the highest spending districts than it is for the students in the remedial classes in the lowest spending districts.[5]

Comparisons of the Disposition of Resources Over Time. Finally, we examined resource disposition over time, and there are a number of key findings. For instance, despite declining enrollments during the period, overall staffing levels in the state increased substantially between 1983–92. As table 3 indicates, growth has not been linear as rapid growth took place between 1983–88 and only modest growth took place between 1988–92. One possible explanation that this growth has plateaued is the recent reductions in state aid, coupled with budget defeats at the local level.

[5] See Monk, Roellke, and Brent (1996) for a more detailed treatment of these results.

Table 3.—District-wide instructional and administrative staffing patterns (number of FTE professional staff per 1,000 district pupils) state totals, big 4 city districts, and New York City: School years 1982–83, 1987–88, and 1991–92

Staffing category	State totals 1983 n=621	State totals 1988 n=644	State totals 1992 n=645	Big 4 cities 1983 n=4	Big 4 cities 1988 n=4	Big 4 cities 1992 n=4	New York City 1983 n=1	New York City 1988 n=1	New York City 1992 n=1
Elementary Education									
Elementary regular	22.83	28.25	29.90	22.46	26.93	26.80	17.25	23.15	21.84
Elementary special education	2.89	3.28	3.67	5.11	6.45	5.66	4.97	5.01	4.73
Total elementary instruction	25.71	31.53	33.57	27.57	33.38	32.46	22.22	28.16	26.57
Secondary Education									
English	5.69	5.88	5.48	4.37	4.88	4.49	4.22	3.94	3.67
Mathematics	4.46	4.90	4.65	3.76	4.54	4.18	3.36	3.57	3.52
Social studies	4.23	4.20	4.19	3.29	3.47	3.22	2.63	2.78	2.66
Science	3.99	4.42	4.23	2.66	3.29	3.03	2.44	2.56	2.39
Foreign language	1.77	2.49	2.55	0.95	1.40	1.50	1.18	1.54	1.41
Music and art	2.69	3.02	2.93	1.67	2.08	1.89	1.36	1.41	1.12
Physical education and health	2.77	2.82	2.56	2.19	2.41	2.03	1.74	1.90	1.61
Other academic	0.92	1.04	0.98	0.97	1.57	2.18	0.99	1.61	2.02
Total academic education	26.52	28.77	27.57	19.86	23.64	22.52	17.92	19.31	18.40
Vocational									
Trade	1.81	2.52	2.28	2.96	3.52	2.91	1.39	1.45	1.07
Business	1.68	1.44	1.17	1.32	1.18	2.09	1.12	0.90	3.05
Other vocational	1.12	0.47	0.34	1.25	0.62	0.55	0.61	0.38	0.30
Total vocational education	4.61	4.43	3.79	5.53	5.32	5.55	3.12	2.73	4.42
Special Education									
Resource room	0.97	1.20	1.29	1.05	1.36	0.94	0.63	1.12	1.07
Special classes	1.05	1.51	1.67	2.67	4.17	3.65	3.21	4.28	4.05
ESL	0.07	0.12	0.16	0.37	0.56	0.44	0.70	1.11	0.85
Other special	0.00	0.02	0.11	0.00	0.48	0.23	0.00	0.03	0.32
Total special education	2.09	2.85	3.23	4.09	6.57	5.26	4.54	6.54	6.29

Table 3.—District-wide instructional and administrative staffing patterns (number of FTE professional staff per 1,000 district pupils) state totals, big 4 city districts, and New York City: School years 1982–83, 1987–88, and 1991–92, continued

Staffing category	State totals			Big 4 cities			New York City		
	1983 n=621	1988 n=644	1992 n=645	1983 n=4	1988 n=4	1992 n=4	1983 n=1	1988 n=1	1992 n=1
Total secondary education	33.22	36.05	34.59	29.49	35.54	33.34	25.58	28.55	29.11
Central administration	1.11	1.23	1.18	1.26	1.44	1.07	1.02	1.03	0.90
School administration	2.30	2.54	2.50	3.85	4.64	4.61	3.10	3.39	3.24
Special administration	4.18	4.90	5.36	3.71	5.02	5.06	3.57	4.13	4.67
Subject administration	3.60	1.57	1.54	4.48	3.67	3.27	4.02	3.24	3.56
Total district administration	11.19	10.23	10.58	13.29	14.77	14.02	11.71	11.79	12.37
Total professional staffing	70.12	77.81	78.73	70.35	83.69	79.82	59.51	68.51	68.04

SOURCE: Basic Educational Data System (BEDS), New York State Department of Education.

Secondary schools have hired more professional staff relative to student enrollment than elementary schools. The increased high school graduation requirements as outlined in the *Regents Action Plan* (1984) may help explain why personnel growth in secondary schools has outpaced the growth in elementary schools. The growth in secondary school staffing appears to have been at the expense of administrative staffing areas. These findings are important because they suggest that school districts configure staffing resources through a combination of adding new staff members and reallocating existing resources.

Table 3 also reveals several noteworthy findings regarding the general staffing patterns in the big cities. Overall professional staffing levels in New York City have consistently trailed the levels in the other big cities and in the State as a whole. These differences are found at both the elementary and secondary level. Because the study is limited to an analysis of certified, professional staff, it is possible that these low staffing levels in New York City are due to a large number of non-professional and para-professional staff members being used in place of certified classroom teachers.

Another interesting finding is that big city staffing commitments to administrative areas have consistently outpaced the staffing commitments made to administration in the state as a whole. As indicated earlier, the higher administrative staffing levels in the large urban areas tend to be at the building and subject area levels. One can only surmise as to why these administrative levels are higher in the big cities. It is possible that the administrative burdens, such as student discipline, are greater at the school level in urban areas than in non-urban areas. The large size associated with urban schools may also contribute to the growth in subject area administration. This explanation is consistent with the breakdowns by district size where the largest districts are found to have the highest staffing commitments to subject area administration.

Table 3 also displays staffing pattern findings by secondary school subject areas. English maintains the highest resource intensity level of the core subject areas, although English also saw the greatest decline in resource commitments during the period. Of the core subject areas, foreign language experienced the greatest growth in staffing (+44 percent). Staffing commitments to special education increased substantially during the period (+55 percent), while staffing levels in vocational areas of the curriculum declined (-18 percent). In addition, special education has become the most resource intensive instructional category within the big cities. Mathematics and science, two areas of the curriculum which have received considerable attention in the reform literature, experienced growth in staffing intensity levels between 1983–88 and slight declines between 1988–92. Staffing levels remained steady in social studies.[6]

The Utilization of Resources

These disposition findings need to be viewed in light of information about the allocation of student time. A finding that there are 5.48 secondary English teachers per 1,000 pupils of district enrollment is difficult to interpret in the absence of parallel information about the allocation of student time to English. Is 5.48 too high, too low, or just about right? A normative question like this will never be easy to answer, but some insight can be gained by seeing how the allocation of the teaching resource base compares to the allocation of the student resource base, and this is the focus of our analysis of resource utilization.

> *...across the state [of New York] English receives 15.84 percent of the teacher resource that is available within the school*

Table 4 begins to provide some of the relevant information about the utilization of resources on a subject specific basis within secondary schools. The columns marked TT report the total number of teachers allocated to a particular subject area relative to the total number of teachers present within the secondary school. It can be interpreted as the percentage share of the teaching resource that has been allocated to the indicated subject areas.

The column marked PT reports the total number of student-hours spent within a given subject area relative to the total possible number of student-hours for the secondary school as a whole. It can be interpreted as the percentage share of the pool of student time that is allocated to the indicated subject area. These student time allocations are by-products of course selection decisions made by students, their parents, and perhaps their guidance counselors.

For example, table 4 indicates that across the state English receives 15.84 percent of the teacher resource that is available within the school. The table also indicates (in the PT column) that English receives 16.57 percent of the total number of student-hours available within the school, for a ratio of 0.96 (column TT/PT). It follows that English receives a smaller share of the available teacher resource than it receives of the available student resource.

Notice that the ratios in the right-hand column of table 4 for all the named academic subject areas are less than 1.0. What this means is that the share of the teacher resource that is allocated to the subject area is *smaller* than the share of the pupil resource base that has been allocated. The fact that the named academic areas have ratios that are less than 1.0 implies that there are other areas of the curriculum with ratios that are greater than 1.0. As we might suspect, the special education portion of the curriculum shows ratios that are significantly greater than 1.0. The resource room heading shows a

[6] For more on these longitudinal analyses, see Roellke (1997).

Table 4.—District-wide secondary school (7–12) instructional staffing patterns for regular New York State school districts and the Big 5 cities: School years 1991–92

Staffing category	State*			Big 4 cities			New York City		
	TT* %	PT* %	TT/PT	TT* %	PT* %	TT/PT	TT* %	PT* %	TT/PT
English	15.84	16.57	0.96	13.60	15.67	0.87	12.61	14.72	0.86
Mathematics	13.44	14.22	0.95	12.62	14.92	0.85	12.09	14.88	0.81
Social studies	12.11	14.97	0.81	9.70	12.99	0.75	9.14	12.72	0.72
Science	12.22	12.38	0.99	9.10	11.21	0.81	8.22	11.24	0.73
Foreign language	7.37	8.22	0.90	4.48	5.35	0.84	4.83	7.04	0.69
Music and art	8.47	8.99	0.94	5.67	7.15	0.80	3.85	4.92	0.78
Physical education and health	7.40	7.84	0.94	6.10	7.50	0.81	5.52	6.78	0.81
Other academic	2.83	2.24	1.26	6.64	4.45	1.49	6.93	8.82	0.79
Total academic education	79.71	85.43	0.93	67.91	79.23	0.86	63.19	81.12	0.78
Trade	6.59	7.17	0.92	8.69	9.22	0.94	3.69	4.28	0.86
Business	3.38	3.26	1.04	6.19	4.14	1.50	10.50	5.76	1.82
Other vocational	0.98	0.84	1.17	1.65	1.14	1.45	1.03	0.81	1.27
Total vocational education	10.96	11.27	0.97	16.53	14.50	0.88	15.22	10.85	1.40
Resource room	3.73	0.98	3.81	2.81	0.73	3.85	3.68	0.89	4.13
Special classes	4.83	1.94	2.49	10.76	4.54	2.37	13.92	4.23	3.29
ESL	0.46	0.24	1.92	1.31	0.92	1.42	2.91	2.83	1.03
Other special	0.32	0.13	2.46	0.68	0.06	11.33	1.10	0.08	13.75
Total special education	9.34	3.29	2.84	15.56	6.25	2.49	21.61	8.03	2.69
Average pupil load per FTE		83.43			78.49			98.21	

NOTE: TT=Percentage share of total teacher-hours; PT=Percentage share of total pupil-hours. Both the TT and the PT percentages are figured on the total resource base for secondary instruction.

SOURCE: Basic Educational Data System (BEDS), New York State Department of Education.

3.81 while the special classroom heading shows a 2.49.

Comparisons with the Big 5 City Districts. Table 4 also provides the breakdowns for the Big Four city districts and New York City. The TT/PT figures for New York City are consistently lower in the academic areas than the Big 4 Cities and the state as a whole. This suggests that academic professional staff in New York City faces relatively high resource demands.

Breakdowns by Course Level and Selected District Structural Characteristics. Next we examined this kind of utilization data by using the advanced versus remedial breakdowns, and also selected district structural characteristics that were introduced earlier (see Monk, Roellke, and Brent, 1996). Recall that the distribution of resources to advanced areas of the curriculum in the core academic areas increases with district spending levels. Some of these increases are relatively dramatic. For example, the overall investment in advanced courses (pooling all areas of the academic curriculum) moves from 2.82 percent of the teacher resource base in the lowest spending districts to 6.36 percent of the teacher resource base for the highest spending districts. But, the percentage share of students enrolled in these advanced courses also increases, rising from 2.69 to 6.86 percent, so that in the net the ratio of the teacher resource share to the pupil resource share drops from 1.05 to 0.93 percent. This means that the increase in the share of the teaching resource does *not* keep pace with the increased student demand for advanced classes. On balance, it means that class sizes in the advanced areas of the curriculum increase with district spending levels. There is a parallel phenomenon transpiring for the remedial classes. Here the shares drop with spending levels, and the teacher share drops by more than the student share so that once again there are net increases in class size for remedial offerings as school district spending increases.

...despite some internal variation within these academic areas, the overall shares of teaching and pupil resources devoted to the core curriculum remain steady.

Comparisons of the Utilization of Resources Over Time. Our longitudinal findings, reported in table 5, suggest that the greatest variation in the utilization ratios in academic areas occurred in foreign language and music/art. The overall utilization ratio for the academic portion of the curriculum, however, remained remarkably consistent. This suggests that despite some internal variation within these academic areas, the overall shares of teaching and pupil resources devoted to the core curriculum remain steady.

Although the highest ratios were found in the special education area of the curriculum, it should be noted that ratios have declined consistently over the period. Because there have been consistent increases in the allocation of pupil time in special education over the period, this finding indicates that increases in pupil demand for special education are not matched with an equal increase in teacher supply. Conversely, student enrollments in vocational offerings have declined over the period. The declining ratios in vocational areas indicates that decreases in the allocation of teacher resources are outpacing the decreases in pupil time in vocational areas.

Summary of Key Findings

Key Findings Regarding the Disposition Analyses

- New York State districts provide roughly comparable teacher/pupil staffing levels for their elementary programs relative to their secondary programs.

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Table 5.—Percentage teacher time/percentage pupil time in secondary schools state totals minus the Big 5 cities

Staffing category	1983 n=621	1988 n=644	1992 n=645
Academic			
English	0.91	0.95	0.96
Mathematics	0.93	0.96	0.95
Social studies	0.84	0.83	0.81
Science	0.96	0.98	0.99
Foreign language	1.01	0.92	0.90
Music and art	1.00	0.94	0.94
Physical education and health	0.96	0.93	0.94
Other academic	1.27	1.32	1.26
Total academic education	0.94	0.94	0.93
Vocational			
Trade	1.15	0.95	0.92
Business	0.93	0.97	1.04
Other vocational	1.10	1.21	1.17
Total vocational education	1.05	0.98	0.97
Special Education			
Resource room	4.57	4.10	3.81
Special classes	3.67	2.62	2.49
ESL	2.10	3.00	1.92
Other special education	—	6.00	2.46
Total special education	3.93	3.12	2.84
Course Level*			
Advanced	0.95	0.98	0.98
Regular	0.88	0.88	0.87
Remedial	1.44	1.49	1.58
Total core	0.92	0.93	0.92

* Core subject areas only.

SOURCE: Basic Educational Data System (BEDS), New York State Department of Education.

- The investment in the academic area of the curriculum comprises 79.71 percent of all teaching resources devoted to the secondary school program (grades 7–12). Excluding BOCES services, the vocational and special education areas comprise 10.96 percent and 9.34 percent of the teacher resource base, respectively.

- In most areas of the curriculum, the teacher resource intensities in the core academic curriculum are lower in the Big 5 City districts than they are elsewhere in the state, with the lowest staffing intensity levels found in New York City.

- There is a tendency in the state to provide more resources to remedial rather than to advanced offerings.

- Resource intensity levels are remarkably flat across large differences in school district spending and wealth levels. It is only among the highest spending and wealthiest districts in the state that we began to find an increase in the number of teachers allocated to subjects on a per pupil basis.

Key Findings Regarding the Utilization of Education Resources

- In all named academic subjects the share of the teacher resource that is allocated to the subject area is *smaller* than the share of the pupil resource base that has been allocated. Areas of the curriculum in which the teacher resource share is greater than the pupil resource share are special education and portions of the vocational curriculum.

- Greater percentages of student time allocations in advanced courses are found in higher spending and wealthier school districts.

- Greater percentages of student time allocations in remedial courses are found in lower spending and poorer districts.

- As district spending increases, the share of the teaching resource does *not* keep pace with the increased student demand for advanced and remedial classes.

Case Study Findings

Disposition Patterns by Secondary School Subject Area

In the disposition analysis, we report findings in several ways. First, we calculated the instructional costs per pupil for each curricular program area across the six sites. For example, we calculated the instructional personnel costs incurred by each school to support a given program area and divided this figure by the total number of students enrolled in courses within that area. This measure provides insight into the intensity of teacher resources made available to different program areas within and between schools. Table 6 summarizes the instructional costs per pupil by program area for each school.[7]

...we calculated the instructional personnel costs incurred by each school to support a given program area and divided this figure by the total number of students enrolled in courses within that area.

Several things can be noticed immediately if we look at the results presented in table 6. First, instructional costs per pupil by program area vary greatly among districts. For example, the Small Poor and Large Poor districts spend significantly less on mathematics than their wealthier counterparts. Similar spending patterns emerge between poor and

[7] School A and School B are used to differentiate between individual schools within districts that contain two high schools.

Table 6.—Instructional costs per pupil by program area in dollars: School years 1994–95

Program area	Small poor ($)	Large poor School A ($)	Large poor School B ($)	Large wealthy School A ($)	Large wealthy School B ($)	Small wealthy ($)
English	364	395	437	612	548	416
Social studies	419	325	332	484	449	362
Mathematics	300	410	471	588	633	555
Science	440	589	554	635	571	863
Language	611	377	448	781	663	530
Business	344	283	301	686	532	419
Health	261	152	200	198	215	250
Physical ed.	119	136	112	467	471	211
Art	472	386	502	728	524	319
Music	866	568	476	702	1,114	404
Driver ed.		388	232			
Special ed.*	3,551	1,494	820	3,404	3,695	2,020
Teacher duties	N/A	N/A	N/A	N/A	N/A	N/A

* These figures do not include district expenditures to Boards of Cooperative Educational Services (BOCES) for the provisions of special education services. BOCES are voluntary, cooperative associations of school districts in a geographic area, which have banded together to provide educational or business services more economically than each could offer by itself. There are 41 BOCES regions in New York State.

SOURCE: Brent, Brian O. and Monk, David H. 1995. "The Distribution of Resources within New York State Public School Systems: A Micro-Level Analysis." Paper presented at the annual data conference of the National Center for Education Statistics, Washington, DC.

wealthy districts in the English, science, and social studies programs areas, although the disparities are much less pronounced.

One explanation for disparities in the per pupil instructional costs across schools is that "price-level" differences in the costs of resources exist across districts. In other words, it would not be surprising to find that wealthier districts pay their teachers higher salaries, thereby inflating the instructional costs per pupil in these schools. Although there are indexes to adjust for differences in instructional costs across districts, these indices are at early stages of development and subject to many challenges. It is interesting to note, however, that in this study the average teacher salaries are higher in the districts labeled as "wealthy." This finding suggests that differences in per pupil instructional costs in core program areas are at least partially explained by differences in salary structures across district types.

Price level differences, however, cannot explain variances in instructional costs per pupil across program areas within the same school or district. As evidenced by table 6, there are large disparities in the amount of resources that districts devote to different program areas within the same school. For example, across all schools, either foreign language or science have the highest instructional costs per pupil of the core program areas. Other high spending program areas are music and special education. In contrast, physical education and health consistently spend the lowest amount per pupil on instructional costs.

Table 7 further highlights disparities in resource use within schools by displaying instructional costs per pupil within the core curricular areas by course level. The table reveals that the Small Poor school offers no advanced courses in the core program areas. In contrast, with a single exception, advanced courses are offered in all other schools in the English, social studies, math, and science areas. Table 7 also reveals that per pupil instructional costs are often highest in the remedial areas of the core curriculum. This holds particularly true in the large wealthy and small wealthy schools.

Differences in these program-specific resource intensities can arise from two sources. First, there can be differences in the personnel costs of individuals assigned to different program areas. For example, all else being equal, if more senior teachers (i.e., higher paid) were assigned to a given program area, we would expect relatively higher instructional costs per pupil. Second, differences in class size directly influence the per pupil cost figures. In this case, one would expect higher instructional costs per pupil in programs areas with relatively small class sizes, all else being equal.

...when program instructional costs are expressed as a percent of total instructional costs, the resources devoted to specific areas of the curriculum are quite similar across schools.

In order to disentangle the effect these phenomena have on district spending patterns, we re-analyzed the data using average teacher salary figures for each district. In other words, we assumed that all district personnel earn the same salary. Table 8 displays the results of this simulation by program area for the Large Poor schools.

The second column of table 8 reports the instructional costs per program when salary levels are held constant. The figures reported therein reveal that variations in the resources devoted to specific areas of the curriculum still exist. Interestingly, spending patterns similar to those reported in table 6 emerge. For example, across both schools, science and foreign language still have the highest instructional costs per pupil of the core program areas. Moreover, music, art, and special education maintain high spending levels while health and physical education spend the lowest amount per pupil on instructional costs. The findings suggest that much of the difference in per pupil expenditures are the result of variations in class size, not salaries.[8]

Given our interest in internal resource allocation practices, it is important to examine directly the decision to divide the pool of resource in one fashion rather than another. To this end we introduce a second type of resource allocation indicator that looks exclusively at the share of the available pool that is allocated to each area of the curriculum. Thus, for each area of the curriculum we provide the percent of total instructional costs that are devoted to the program area.

Table 9 reveals that when program instructional costs are expressed as a percent of total instructional costs, the resources devoted to specific areas of the curriculum are quite similar across schools. This is particularly true of schools within the same district. For example, with few exceptions, the percentage of instructional resources devoted to the core program areas (English, social studies, math, science, and foreign language) vary only slightly across districts. This suggests that, while the size of the district's pool of resources may vary among districts, in general, districts assign similar priorities to program types when dividing this pool. There are, however, some exceptions to this general trend. Most notably, the comparatively high percentage of resources devoted to the science program areas in School A of the Large Poor district and

[8] Similar patterns emerged in the other three sites.

Table 7.—Instructional costs per pupil by core program area in dollars: 1994–95

Program area	Small poor	Large poor School A	Large poor School B	Large wealthy School A	Large wealthy School B	Small wealthy
English						
Advanced		234	276	258	395	336
Regular	251	237	260	379	379	319
Remedial	242	321	311	1,294	794	
Social studies						
Advanced		303	310	484	493	298
Regular	269	240	211	348	314	277
Remedial	231	295	246	857	683	
Mathematics						
Advanced		277		347	325	742
Regular	206	262	287	378	386	778
Remedial	237	295	375	505	683	301
Science						
Advanced		294	476	160	138	437
Regular	380	457	447	340	382	330
Remedial	208	342	261	616	513	652
Foreign language						
Advanced				549	507	
Regular	611	390	477	435	353	530
Remedial		199	220			

SOURCE: Brent, Brian O. and Monk, David H. 1995. "The Distribution of Resources within New York State Public School Systems: A Micro-Level Analysis." Paper presented at the annual data conference of the National Center for Education Statistics, Washington, DC.

Table 8.—Percentage change in instructional costs due to salary differentials: School years 1994–95

Program area	School A: Instructional cost per unit actual salary	School A: Instructional cost per unit average salary	School A: Percent change (%)	School B: Instructional cost per unit actual salary	School B: Instructional cost per unit average salary	School B: Percent change (%)
English	395	416	5	437	412	-6
Social studies	325	319	-2	332	338	2
Mathematics	410	414	1	471	436	-7
Science	589	512	-13	554	556	0
Foreign language	377	425	13	448	462	3
Art	386	468	21	502	443	-12
Music	568	490	-14	476	414	-13
Business	283	278	-2	301	346	15
Health	152	206	36	200	225	13
Pysical education	136	130	-4	112	111	-1
Driver's education	388	317	-18	232	200	-14
Special education	1,494	1,524	2	820	934	14

SOURCE: Brent, Brian O. and Monk, David H. 1995. "The Distribution of Resources within New York State Public School Systems: A Micro-Level Analysis." Paper presented at the annual data conference of the National Center for Education Statistics, Washington, DC.

Table 9.—Instructional costs by program area as a percent of total program instructional costs: 1994–95

Program area	Small poor	Large poor School A	Large poor School B	Large wealthy School A	Large wealthy School B	Small wealthy
English	14	12	14	14	13	12
Social studies	13	13	13	12	13	12
Mathematics	8	11	12	11	12	13
Science	10	16	13	13	13	19
Language	8	6	8	10	10	10
Business	6	8	9	7	7	7
Health	2	1	1	2	2	2
Pysical education	5	10	8	9	9	5
Art	6	4	4	7	7	4
Music	9	6	6	4	5	5
Driver's education		2	1			
Special education*	9	8	7	6	7	4
Teacher duties	12	4	4	5	2	7

* The percent of resources allocated to special education versus regular program areas is much less than has been reported in other research efforts. For example, in a recent study of exenditures across New York State school districts, Lankford and Wyckoff (1995b) estimate the percentage of instructional resources allocated to special education to be approximately 20 percent. The significant gap between the percentages reported here and those found by Lankford and Wyckoff are partially explained by the exclusion BOCES related special education costs and the focus on secondary school only.

SOURCE: Brent, Brian O. and Monk, David H. 1995. "The Distribution of Resources within New York State Public School Systems: A Micro-Level Analysis." Paper presented at the annual data conferenece of the National Center for Education Statistics, Washington, DC.

the Small Wealthy district. In both cases it was found that these schools offer general level courses within each sub-discipline of the core science curriculum (e.g., general physics), thereby increasing the instructional costs of this program area. Similarly, the comparatively low percentage of teacher resources devoted to language in School A of the Large Poor district is explained by the low salary levels of newly hired teachers in this program area.

Our micro-level examination of instructional costs per program area also gave us the opportunity to quantify teacher to resource uses that have received virtually no attention in the literature: time devoted to duty periods and time devoted to class preparation.

Teachers are often required to monitor study halls and corridors, or perform cafeteria duty. Table 9 reports that the percentage of total instructional costs devoted to these non-instructional duties range from 2–12 percent. It also reveals that smaller districts require their teachers to devote significantly more of their time to the performance of non-instructional duties than their larger counterparts.

In addition to direct classroom instruction and teacher duties, teachers are also assigned a number of preparation periods. For our purposes, all periods for which teachers were not assigned to direct classroom instruction or duties were counted as preparation periods. Teacher preparation time does not include

the contracted time set aside for teachers to eat lunch. Table 10 presents teacher preparation time per program area as a percent of total instructional costs per program area.

Table 10 reveals that, in general, teacher preparation time is quite varied across program areas and schools. A more interesting finding, however, is the amount of teacher resource use that is devoted to preparation time. These figures suggest that, on average, teachers are allocated between 2–3 preparations periods per an 8-period day. Again, these figures do not include contracted time for lunch.

The Utilization of Teaching Resources Within Secondary Schools

To address our interest in the utilization of resources, we first made a calculation of the pupil-time resource. In other words, we generated a series of program specific indicators that tell us the percentage of the pool of student-time resource that is devoted to each area of the curriculum. With the percent teacher time and percent pupil time in hand it became possible to generate an index of resource utilization. In our analyses, we relied upon a ratio of the two percentages as our measure of resource utilization. The teacher resource share appears in the numerator of the ratio, so a figure of 1.3 for a given subject area suggests that 30 percent more teacher resources are devoted to the subject area in question. Thus, low readings in on this indicator suggest that the teacher resource in question is facing relatively heavy demands.[8] Table 11 displays the results of these calculations.

The fact that some teacher resource shares are larger than the corresponding student resource share suggests that there will be balancing subject areas where the opposite will be true.

This analysis revealed several striking results. First, with the exception of Special Education, the highest indices often occur within the music area of the curriculum. The utilization indicators for music exceeds 1.00 in all districts, measuring as high as 1.87 in the Small Poor district. Again, a value of 1.87 suggests that the supply of teacher resource is 187 percent larger than the supply of student resources to the curricular area in question. Another area of the curriculum where the teacher resource share exceeds that of the student resource is foreign language.

The fact that some teacher resource shares are larger than the corresponding student resource share suggests that there will be balancing subject areas where the opposite will be true. Our findings indicate that these balancing areas occur in English, social studies, art, physical education, and health.

While we have distinguished sharply between the disposition and utilization aspects of the resource allocation process, it is clear that these two types of phenomena can be closely linked. Students' willingness (both real and perceived) to utilize resources can have strong effects on disposition decisions. Similarly, students' responses are likely to be sensitive to the types of resources that are made available. It would be interesting to explore, for example, whether staffing patterns are structured to provide student's with equal access to curricular opportunities. While district fiscal reports provide insight into the distribution of resources across expenditure categories across districts, limits inherent in the use of district financial reporting documents prohibit more informative analysis of resource allocation patterns. Indeed, district level reports provide only limited insight into the internal decision making processes that produce any given distribution of resources.[9]

[8] For more qualitative analyses of the process by which staffing allocations are made, see Roellke (1996).

Table 10.—Teacher preparation time per program area as a percent of total instructional costs per program area

Program area	Small poor	Large poor School A	Large poor School B	Large wealthy School A	Large wealthy School B	Small wealthy
English prep	36	33	36	23	33	31
Social studies prep	34	32	38	26	34	30
Mathematics prep	31	36	36	23	36	32
Science prep	31	30	30	30	36	24
Language prep	33	27	38	28	34	33
Business prep	28	24	21	21	35	29
Health prep	38	29	38	15	14	23
Pysical education prep	32	22	41	19	27	18
Art prep	33	36	34	26	27	17
Music prep*	81	62	67	46	25	76

* Due to limitations in the data sources, it was not possible to distinguish between periods devoted to individualized lessons from periods devoted to preparation. Therefore, the percentage of instructional costs allocated to music preparation time is overstated.

SOURCE: Brent, Brian O. and Monk, David H. 1995. "The Distribution of Resources within New York State Public School Systems: A Micro-Level Analysis." Paper presented at the annual data conference of the National Center for Education Statistics, Washington, DC.

Table 11.—Instructional costs per pupil by program area in percent/percentage of total students enrolled in program area

Program area	Small poor	Large poor School A	Large poor School B	Large wealthy School A	Large wealthy School B	Small wealthy
English	0.86	1.11	1.21	1.00	0.93	0.83
Social studies	0.83	0.91	0.92	0.80	0.76	0.73
Mathematics	0.65	1.15	1.30	1.20	1.08	1.11
Science	0.95	1.47	1.50	1.00	1.00	1.73
Language	1.32	1.06	1.24	1.25	1.11	1.06
Business	0.74	0.79	0.83	1.12	1.00	0.84
Health	0.57	0.43	0.55	0.29	0.33	0.50
Pysical education	0.28	0.38	0.31	0.75	0.82	0.42
Art	1.02	1.08	1.39	1.12	0.88	0.64
Music	1.87	1.60	1.32	1.33	1.67	1.01
Driver's education		1.09	0.64			
Special education	7.68	4.19	2.27	6.00	7.00	4.05

SOURCE: Brent, Brian O. and Monk, David H. 1995. "The Distribution of Resources within New York State Public School Systems: A Micro-Level Analysis." Paper presented at the annual data conference of the National Center for Education Statistics, Washington, DC.

Summary of Key Findings

- The Small Poor and Large Poor districts spend significantly less on math than their wealthier counter parts. Similar spending patterns emerge between poor and wealthy districts in the English, science, and social studies program areas, although the disparities are much less pronounced.

- Across all schools, either foreign language or science have the highest instructional costs per pupil of the core program areas. Other high spending program areas are music and special education. In contrast, physical education and health consistently spend the lowest amount per pupil on instructional costs.

- When program instructional costs are expressed as a percent of total instructional costs, the resources devoted to specific areas of the curriculum are quite similar across schools. This is particularly true of schools within the same district. This suggests that, while the size of the district's pool of resources may vary among districts, in general, districts assign similar priorities to program types when dividing this pool.

- The percentage of total instructional costs devoted to non-instructional duties range from 2–12 percent. Smaller districts require their teachers to devote significantly more of their time to the performance of non-instructional duties than their larger counterparts.

- On average, teachers are allocated between 2-3 preparation periods per an 8 period day. These figures do not include contracted time for lunch.

- With the exception of Special Education, the highest utilization indices occur within the music area of the curriculum. Another area of the curriculum where the teacher resource share exceeds that of the student resource is foreign language.

...contributions to new conceptions of educational equity can be made through the analysis of more refined indicators of instructional opportunities for students.

Implications for Policy and Future Research

These findings represent early and still quite incomplete attempts to characterize the allocation of resources at micro-levels of educational systems. For example, it must be noted that the empirical findings presented here are limited to analyses of professional staff only. Local education agencies purchase many hired resources which are not considered here (custodial workers, cafeteria workers, clerical staff, etc.) Similarly, these analyses do not consider allocations of capital resources (physical plant, supplies, texts, computers, etc.). The omission of these important pools of resources limits the ability to gain a comprehensive understanding of resource allocation phenomenon.

Despite this limitation, this type of resource allocation study has much to offer educational theory and practice and can make several contributions to the field. First, contributions to new conceptions of educational equity can be made through the analysis of more refined indicators of instructional opportunities for students. Second, this type of study can inform current policy debates regarding education reform, particularly those aspects of reform which involve the re-configuration of teaching and other human resources. Indeed, the findings as they stand invite many important questions that are rich in implications for public policy. The following represent just a few possibilities:

- Why does "administration" represent 13.4 percent of school districts' professional staff, and

is it appropriate for special education administration to constitute more than 50 percent of the staffing resources devoted to administration?

- Why is the discrepancy in the allocation of resources between "regular" and special types of offerings (i.e., advanced and remedial) as large as it is and should it be smaller/larger?

- Why are the staffing intensity levels so much lower in the Big 5 City districts than they are elsewhere in the state?

- How appropriate are the investments in teacher preparation and duty periods and why do these allocations vary so widely across subject areas?

- What is the justification for discrepancies between the share of teacher and student time resources devoted to particular subject areas and to what degree are these conscious efforts on the part of school officials to assign high and low priorities to specific areas of the curriculum?

Questions of this sort are much easier to ask than to answer, but having the New York research results provides useful base-line data and permits the formulation of the questions. The results bear on important policy debates over the proper distribution of resources between elementary schools, secondary schools, and administrative uses. They also provide new insights into the internal allocation of resources across subject areas within secondary schools. The comparisons between urban and other kinds of districts are relevant to important equity arguments currently being made in New York and elsewhere, and the breakdowns according to district structural characteristics reveal some surprising results that can throw light on the underlying forces that give rise to resource allocation behaviors. For example, it is quite intriguing to learn that staffing levels within core academic subject areas at the secondary level are relatively flat across wide ranges of school district spending levels.

...concerns about the efficient use of these resources can only be addressed through a more thorough analysis of how these resources are translated into student outcomes.

The case study analyses permitted us to reach even more deeply into school and school district resource allocation practices. The micro-level resource allocation model gave us the opportunity to quantify two uses of teacher resources which have received virtually no attention in the literature: 1) the time teachers spend on preparation; and 2) the time teachers devote to non-instructional duties.

While our work in New York using state collected data demonstrates progress in the area of micro-level resource allocation, there are numerous opportunities for researchers in educational administration to extend these analyses. A logical extension of this work is to trace the flow of human resources to even deeper points within the educational system. We do not explicitly address, for example, the allocation of actual student effort in the classes in which they are enrolled. Another important extension of this work involves gaining a deeper understanding of how these resource allocation patterns relate to measures of student performance. While it is important to understand how resources are allocated and used for equity purposes, concerns about the efficient use of these resources can only be addressed through a more thorough analysis of how these resources are translated into student outcomes. Fortunately, these research programs are all complementary, and we hope this paper stimulates further interest in this type of work.

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Race, Poverty, and the Student Curriculum, 1975–1995: Implications for Public Policy

Nicola A. Alexander
Florida Atlantic University

About the Author

Nicola A. Alexander is an Assistant Professor at the School of Public Administration, College of Urban and Public Affairs at Florida Atlantic University. She is interested in public finance and budgeting, especially as it relates to elementary and secondary schools and resource allocation issues.

Ms. Alexander is presently finishing her doctoral thesis on the impact of curriculum standards on educational outputs from the Nelson A. Rockefeller Graduate School of Public Affairs and Policy at the University at Albany. She is a member of the American Education Finance Association, the Association for Public Policy Analysis and Management, the American Society of Public Administration, Pi Alpha Alpha (Public Administration Honor Society), and the National Tax Journal.

Race, Poverty, and the Student Curriculum, 1975–1995: Implications for Public Policy

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Introduction

As a nation, we are concerned that the "rising tide of mediocrity" predicted by the National Commission on Excellence in Education (1983) has not ebbed. Not only are average scores low for the typical student, but minority and poor students are consistently scoring at the lower end of the performance spectrum. Many policymakers are especially troubled by the notion that school outputs are linked with the student characteristics of race and income (Bowles and Gintis 1976; Cookson and Persell 1985; Kershaw 1992). For instance, substantial gaps in the academic performance of black and white students appear as early as age 9 and persist through age 17 (National Center for Education Statistics 1995b, 3). In addition, among students who graduate from high school, a lower percentage of graduates from low income families were enrolled in college the October following graduation — 40 percent versus 78 percent in 1991 (NCES 1993, 3).

There are a variety of policies that have been used to reduce this apparent association between educational outputs and student characteristics.[1] One currently popular strategy is the adoption of curriculum standards, where states play an active role in regulating the courses taken by students (CCSSO 1995). This approach assumes that there is a link between student attainment and course-taking patterns (Alexander and Pallas 1984). If this assumption is true, differential access to the curriculum becomes very important, particularly on equity grounds.

Consequently, it is important to track the course selection that students have made over time. This study is a descriptive analysis whose principal focus is the association between course-taking patterns and the student characteristics of race and poverty. To

[1] These "equalizing" programs include Head Start, busing, equalizing aid, etc.

uncover the trends in course-taking patterns and to explore the potential role of curriculum policy, this paper addresses three questions:

- How has student usage of the curriculum changed over time? Is there a change in emphasis on "traditional" core courses or the class time spent by students in advanced courses (e.g., college credit, Advanced Placement)?
- What is the association between socioeconomic factors and student course-taking patterns?
- What are the implications of this trend for curriculum policy?

The Relevance of Curriculum

What do we mean by curriculum?

Page and Valli (1990, 2) note that the curriculum is a fundamental part of schooling and that high schools have the difficult task of "differentiating without discriminating." They continue:

> ...the curriculum is commonly posited as the school knowledge that an individual teacher transmits to students with the success of all measured by students' achievement test scores. However, the curriculum that occurs in classrooms is much more inclusive than this definition suggests, and school knowledge is shaped in significant ways by the responses, reactions, and on occasion, the counterdefinitions offered by students (p.5).

Thus, curriculum in this paper refers to more than the required courses; it refers to *all* the courses taken by students. This is in contrast to curriculum standards, which do refer to the courses required by the state. As noted, one reason why states impose curriculum standards is to reduce the variation in the course selection of students because of the assumed link between curriculum standards and course selection.

Differential course-taking: implications for curriculum quality

Much of the research on tracking has found that the quality of the curriculum to which a student is exposed has an impact on the quality of learning that takes place (Oakes 1982, 1985; Vanfossen et al. 1987). This influence is often mediated through the impact that curriculum tracks have on the choice of courses selected by students (Lee and Bryk 1988). This influence is above and beyond and even greater than the impact of prior academic performance and interests (Vanfossen et al. 1987). Course-taking patterns in turn influence how much students learn of subjects such as mathematics, science, or business, and also how much practice they obtain in reading and vocabulary (Vanfossen et al. 1987). Consequently, many authors contend that students in non-academic tracks are not given an environment that encourages them to increase their performance and their educational and occupational aspirations (Oakes 1985; Vanfossen et al. 1987). They also note that too often poor, minority students are over-represented in these low, special, or vocational tracks (Page and Valli 1990, 2).

This line of argument implies that the more knowledge to which a student is exposed, the more that student will remember in absolute terms. An example will illustrate this point. Let us assume that

an academic curriculum provides three times the "knowledge" of a low-track curriculum. Thus, remembering 50 percent of the academic coursework produces absolutely more "knowledge" than remembering 100 percent of the less-challenging material, all else being equal. This assumption is supported by the work of Alexander and Pallas (1984). These authors find that the test scores of students who complete the "New Basics"[2] are considerably higher, on the average, than of those who do not. However, these findings may overstate the influence of taking a challenging curriculum. That is, while Alexander and Pallas note that "better" students are likely to take more challenging courses, they only control for different innate abilities by including a predictor variable for prior performance. The authors do not adequately address the issue of selection bias.

Differential course-taking: implications for curriculum policy

Fuhrman et al. (1993) note that changes in curriculum policy and testing often are not translated into instruction in the classroom. Though stricter graduation requirements have increased the proportion of academic courses offered in high schools, they may not have increased the number of students who actually take them (p. 5). This is where the signals emitted by higher education and businesses become very important in the enhancement of school quality (Bishop 1993, 1994, 1996).

Fuhrman et al. (1993) note that changes in curriculum policy and testing often are not translated into instruction in the classroom.

Bishop argues that policymakers can greatly influence the quality of schooling for all students if they make use of the appropriate signals and incentives. According to the author, increased reliance on sound high school education by employers and institutions of higher learning will act as a signal to those involved in the educational process (parents, teachers, students). Moreover, external curriculum-based assessments in specific high school subjects will increase the students' rewards for learning. Bishop contends that this combination of signals and rewards will persuade the student to choose more demanding courses and to work harder in them (Bishop 1994, 2). The model advocated by Bishop is supported by anecdotal evidence from Fort Edwards and North Babylon, two school districts in New York State (NY Teacher 1996). In addition, preliminary findings by Alexander (1996) regarding high school students in New York State suggest that there is a statistically significant association between curriculum standards and four-year college attendance.

External examinations will induce teachers and administrators to provide rigorous courses and to place high academic demands on all their pupils. This logic implies that there are benefits to be gained from the taking of difficult courses separate and apart from the mere attendance of school. Gamoran (1987) finds, for example, that the difference in achievement between tracks exceeds the difference in achievement between students and dropouts. The author infers from this that cognitive development is affected more by where one is in school than by whether or not one is in school. The above analysis suggests that the provision of a high-quality curriculum[3] for all students will have a favorable impact on average student achievement.

[2] The "New Basics" include four units of English, three units of science, three units of social studies, three units of mathematics, and a half unit of computer science. College-bound students are advised to add two units of foreign language to the recommended list of requirements.

[3] A high-quality curriculum refers to those courses normally provided to those students in an academic, college preparatory track.

Data and Research Approach

Research population

New York State is the only state with a long-standing reliance on a curriculum-based examination system covering the majority of high school graduates. New York's high school student population is also relatively diverse. For instance, in Fall 1991, the student population of New York State was comprised of 4.4 percent Asians, 19.8 percent blacks, 15.1 percent Latinos, 0.3 percent Native Americans, and 59.9 percent whites (NYS 1993). This diversity makes New York a good place from which to explore how poverty and race are associated with course-taking patterns and what implications this association has for curriculum policy.

The following analysis focuses on the population of public school students in New York in grades 9 through 12 by using school level data weighted by enrollment. The analysis can, therefore, make meaningful comments on the trends in high school student usage of the curriculum in that state. I examine those grades because much of the discussion on performance and curriculum standards centers around high school students. To the extent that curriculum reform has some universal effects, the findings of this study may have important implications for the rest of the nation.

New York State is the only state with a long-standing reliance on a curriculum-based examination system covering the majority of high school graduates.

Data sources

This study relies on data provided in the Basic Educational Data System (BEDS) of the New York State Department of Education, in particular, the information found in the Personnel Master File (PMF) and the Institutional Master File (IMF). The PMF contains classroom-level data on professional staff in each public and non-public school in New York State. The IMF contains information on race and socioeconomic status of each school in the state. The study covers 20 years, from 1974–75 through 1994–95, with data obtained at five-year intervals starting with the 1974–75 school year.

Curriculum standards defined

When policymakers consider curriculum standards, their discussion is often in terms of student participation in selected subjects, as well as, their participation in courses of a prescribed rigor. Thus, the higher the participation in core courses (English, foreign languages, mathematics, science, and social studies) the higher educational standards are thought to be. Further, the higher the participation in advanced versus remedial courses, the higher standards are thought to be. Following the lead of many states, this is the definition of curriculum standards used here.[4]

To measure student participation in courses, I rely on data contained in the PMF. It includes information on assignment codes (course title), number of students in each class, and the number of times the class is taught during the year. Note that class time is measured in periods.

Curriculum standards are operationalized using a variable which captures the average number of student class periods devoted to a specific curriculum

[4] Some policymakers, educators, and parents would argue that this is an overly narrow viewpoint which neglects two key issues. One, a knowledge of music and art can enhance the overall education of a child. Two, this definition undervalues the benefits of vocational education, which educators, such as John Dewey, applaud for the relevance it brings to the classic curriculum.

area in a school week. The numerator is the product of multiplying the number of students in a particular course by the length of the course. The denominator of this ratio is the total number of enrolled students. These weekly figures are based on the assumption that there are 36 weeks in the school year—180 days in a school year divided by 5 days in a school week.

There are several advantages to this measure: 1) by taking the average number of periods devoted to particular courses, consistent comparisons across schools, districts, and time are possible; 2) controlling for enrollment allows this measure not to be affected by spurious increases in the population having no direct connections with curriculum policy; 3) this ratio is not affected by the length of the school day; and 4) it mirrors the underlying notions of many state curriculum policies where actual, not proportionate, time assigned to specified curriculum areas is considered important to student achievement.

Course categorizations—subject

I focus on the courses traditionally associated with a core curriculum—language arts (English and reading), foreign languages, mathematics, science, and social studies. The categorization also includes courses in limited English proficiency (LEP) (including special education LEP) and special education classes (excluding LEP courses). This study focuses on the curriculum of grades 9 through 12. The grouping according to subject area relies primarily on the categorizations denoted by the New York State Department of Education in their course listings.

I focus on the courses traditionally associated with a core curriculum—language arts (English and reading), foreign languages, mathematics, science, and social studies.

Coding of courses

I created sub-categories of the courses based on both their rigor and subject area (see table 1). The first digit of the code is the subject area, the second is the rigor. Note that classes in (LEP) have no rigor specified. LEP classes include those that are so titled by the New York State Education Department, as well as, those classes offered in bilingual education. Classes in special education have a "learning disabled" sub-category.

I originally planned to have 23 sub-groupings: five core subjects at four levels of rigor plus the LEP and special education categories. However, given the nature of the available data, I am unable to do so. That is, the sequence of Regents courses is very detailed for mathematics and science, so it is possible to consistently categorize a course as Regents or not for those two areas by merely observing the course title. However, outside of those areas, the titles no longer give sufficient information regarding the Regents status of the course. Thus, it is difficult to create consistent Regents categorizations across time and school districts for these subject areas. For instance, French I could be a Regents level class in one school and a non-Regents one in another.[5]

I ultimately developed an exhaustive set of 20 course groupings. Not all 20 groups are present in each school. To the extent that Regents courses in English, foreign languages, and social studies are classified as regular, this study systematically underestimates the average number of student class periods per week devoted to a Regents curriculum.

Student characteristics

A primary objective of this paper is to explore the association between the student characteristics of

[5] My thanks to Ron Danforth, an expert in the contents of the New York State Basic Educational Data System, who was instrumental in the proper classification of courses.

Table 1.—Course codes and descriptions

Course	Description of course
11	Remedial English
12	Regular English
14	Advanced English
21	Remedial Foreign Language
22	Regular Foreign Language
24	Advanced Foreign Language
31	Remedial Mathematics
32	Regular Mathematics
33	Regents Mathematics
34	Advanced Mathematics
41	Remedial Science
42	Regular Science
43	Regents Science
44	Advanced Science
51	Remdial Social Studies
52	Regular Social Studies
54	Advanced Social Studies
60	Limited English Proficiency
70	Special Education
75	Learning Disabled—Special

*SOURCE: Alexander, Nicola, unpublished tabulations from data received from the New York State Department of Education Basic Education Data System.

race and poverty and course-taking patterns. Because the data are aggregated at the school level, I will use the ethnic profile (i.e., percentage minority of schools as a proxy for race; the lunch participation rate as a proxy for poverty). For each characteristic, I classify schools into three mutually exclusive categories. That is, schools are high minority; mixed minority; or low minority on the ethnic index. Similarly, schools are high poverty; medium poverty; or low poverty on the poverty index. I expect that schools with high minority population and/or high lunch participation have relatively fewer student class periods devoted to a core or advanced curriculum than their "whiter" or more wealthy counterparts (Kershaw 1992; Oakes 1985).

This study classifies high minority schools as those that have student populations with at least 80 percent black and Latino students. Schools that have between 80 percent and 5 percent of its population comprised of black and Latino students are considered mixed. I consider schools with five percent or less of their student population comprised of black and Latino students as low minority schools. These thresholds are constant for all years of the study.

Schools that have at least 35 percent of their student population participating in a free or reduced-price lunch program are considered to be high on the poverty index. Schools that have between 35 percent and 1.5 percent of their student population participat-

ing in a free or reduced-price lunch program are considered to have medium poverty. I consider schools that have 1.5 percent or less of their students participating in the lunch program to be low on the poverty index. Note that lunch participation data are only available for 1995. The ethnic thresholds are chosen to reflect: 1) meaningful categories of what it means to be a high minority school; and 2) an appropriate balance of the distribution of students of color across schools and over time. In 1995, for example, in a weighted distribution of schools, 10 percent of schools had more than 90 percent of their student population comprised of blacks and Latinos. Similarly, the poverty thresholds reflect the distribution of lunch participation in schools. For instance, in 1995, 10 percent of schools had more than 36 percent of their students participating in a free or reduced-price lunch program; 25 percent of schools had about 1.5 percent of their students participating in this program.

Findings

Question 1: The curriculum over time

As table 2 shows, the average number of student class periods per week devoted to the core has increased substantially over the past 20 years (11.6 in 1975 versus 19.1 in 1995). The largest changes occurred between 1985 and 1990, where the average number of student class periods devoted to traditional academic subjects increased by 27.6 percent. This jump likely reflects the implementation of the Regents Action Plan in 1984.

...the average number of student class periods per week devoted to the core has increased substantially over the past 20 years (11.6 in 1975 versus 19.1 in 1995).

The most dramatic change in course-taking behavior is in the area of Special Education. From 1975 through 1985, two-hundredth or less of student class periods per week was devoted to special education; by 1995, this increased to one period per week. This enormous growth is likely a reflection of the gradual implementation of Public Law (P.L.) 94-142, the Education for All Handicapped Children Act, enacted in 1975.

Table 2 also shows the average number of student class periods devoted to the core curriculum by subject each week. The time allotted to English has remained relatively constant over the past two decades (4.4 in 1975, 4.7 in 1985, and 4.4 in 1995). The changes in the areas of foreign languages, mathematics, science, and social studies are more striking. Indeed, the average number of student class periods devoted to mathematics increased dramatically from a low of 1.1 student class periods per week in 1975 to a high of 4.0 student class periods in 1995. The increases in the other core subjects are less remarkable. Foreign languages accounted for 1.3 student class periods per week in 1975 and 2.1 student class periods in 1995. Science accounted for 3.2 student class periods in 1975 and 4.3 in 1995; average weekly student class periods devoted to social studies increased from 1.5 to 4.2 over the same time period.

Rigor

Figure 1 shows the general trend in the difficulty of the core courses taken by students. Over the past two decades, steadily increasing numbers of student class periods per week were devoted to advanced and Regents courses (1.2 in 1975 versus 5.4 in 1995).[6] By contrast, fewer student class periods are allotted to remedial coursework (1.6 versus 0.4). The time allotted to regular-level classes increased steadily over the past 20 years (8.8 in 1975 versus 13.3 in 1995).

[6] To the extent that this paper undercounts Regents class periods because it uses only mathematics and science Regents classes, this portion may be bigger. However, unless the portion of student class hours for Regents English, Regents foreign languages, and Regents social studies varies dramatically over time, the longitudinal analysis should still hold true.

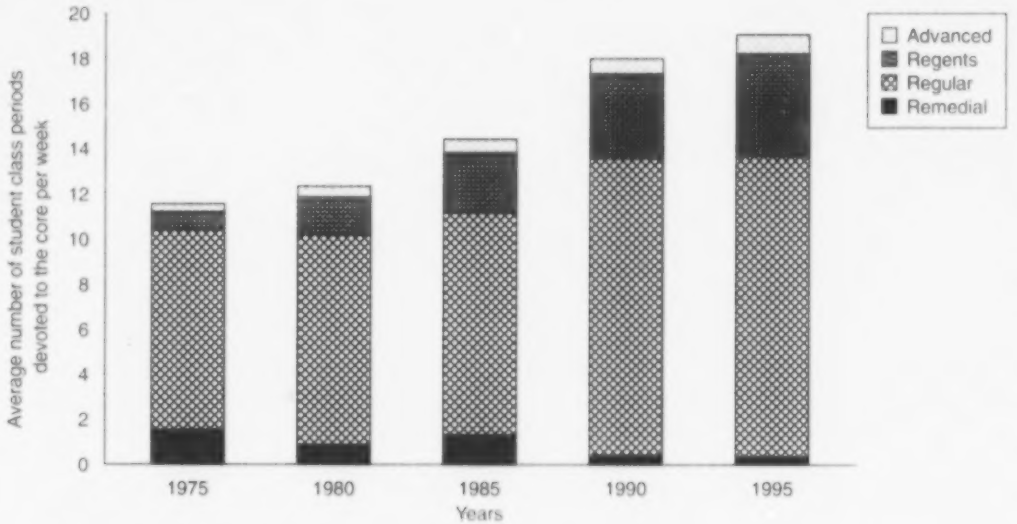
Table 2.—Statewide trends in course taking: School years 1974–75 through 1984–85

Subjects	Average number of student class periods per week				
	1975	1980	1985	1990	1995
Core					
English	4.4	4.5	4.7	4.3	4.4
Foreign languages	1.3	1.2	1.5	2.2	2.1
Mathematics	1.1	1.9	2.8	3.6	4.0
Science	3.2	3.2	3.6	4.0	4.3
Social studies	1.5	1.6	1.8	3.9	4.2
Total core*	11.6	12.3	14.4	18.0	19.1
Non-core	14.3	13.7	14.1	11.3	10.5
LEP	0.07	0.12	0.18	0.06	0.09
Special education					
All fields without learning disabled	0.01	0.02	0.01	0.60	0.70
Learning disabled	—	—	—	0.30	0.30
Total special	0.01	0.02	0.01	0.90	1.00
Total*	25.9	26.2	28.8	30.2	30.7

* May not sum due to rounding.

SOURCE: Alexander, Nicola, unpublished tabulations. Results of conducting univariate analysis on relevant data from the New York State Basic Education Data System using SAS.

Figure 1.—Course-taking patterns—the rigor of the courses: School years 1974–75 through 1994–95



SOURCE: Diagrammatic representation using Excel based on univariate analysis conducted on relevant data from the New York State Basic Education Data System and those compiled by author.

The changing face of mathematics and science

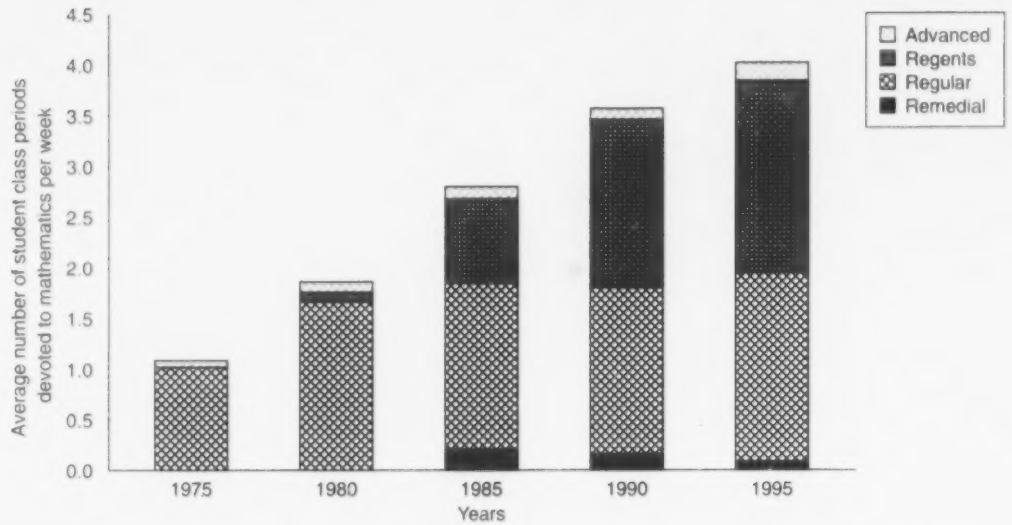
A closer look at the rigor of mathematics and science courses will give better insight on the changing nature of high school curriculum standards in New York State. Figures 2 and 3 show the average number of student class periods devoted to mathematics and science over the past 20 years, respectively. The average time students devote to these traditionally difficult subjects, as well as advanced classes in these areas, increased over the period.

While the trend in course level (rigor) is similar in many ways for mathematics and science, some key differences are worth noting. For instance, the largest percentage increase in the number of student periods allotted to Regents and advanced mathematics courses occured between 1980 and 1985 (0.20 versus 0.95). After 1985, substantial increases in time were still made, but at a declining rate. In 1990 and 1995, Regents and advanced mathematics classes accounted for 1.8 and 2.1, respectively, of student class periods per week.

Further, as time allotted to mathematics increased, the use of remedial mathematics classes expanded. In 1975, no class period was devoted to remedial mathematics in high school; by 1985, one-fifth of a student class period was devoted weekly to math at the remedial level. By 1995, however, there is a downward shift in mathematics time devoted to remedial courses (0.15 in 1990 versus 0.08 in 1995).

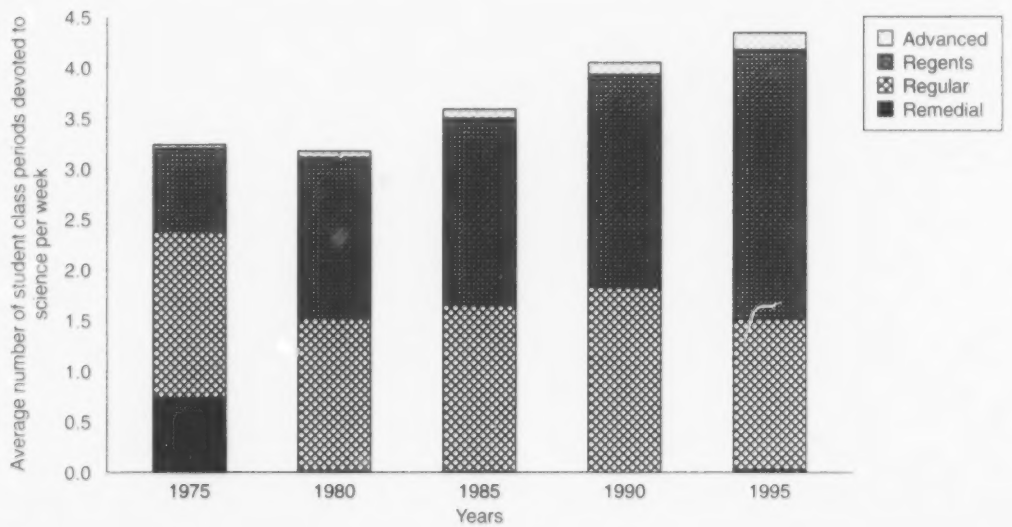
By contrast, increased time devoted to science is accompanied by a drastic reduction in the time allotted to remedial science courses. In 1975, on

Figure 2.—Average number of student class periods devoted to mathematics, by rigor: School years 1974–75 through 1994–95



SOURCE: Diagrammatic representation using Excel based on univariate analysis conducted on relevant data from the New York State Basic Education Data System and those compiled by author.

Figure 3.—Average number of student class periods devoted to science, by rigor: School years 1974–75 through 1994–95



SOURCE: Diagrammatic representation using Excel based on univariate analysis conducted on relevant data from the New York State Basic Education Data System and those compiled by author.

average 0.73 of a student class period was devoted to science at the remedial level each week. In the subsequent five years, this number fell sharply and continued to decline until it "bottomed out" in 1990 with no time devoted to remedial science classes. By 1995, this average number increased slightly to less than one-hundredth of a student period per week.

The biggest increase in Regents and advanced science classes occurred between 1975 and 1980 (0.85 versus 1.65). The average number of student class periods allotted to Regents and advanced science increases steadily over the next 15 years (1.94 in 1985, 2.22 in 1990, and 2.83 in 1995).

Question 2: Race, poverty, and course-taking behavior

As figures 4, 5, and 6 illustrate, there is not much variation in the average number of student class periods devoted weekly to the core subjects when we consider the ethnic and poverty profile of the student population. In no year of the study were there statistically significant differences in the course-taking patterns of high minority schools and their "whiter" counterparts.[7] Similarly, high poverty schools do not devote significantly less time to the core than their more wealthy counterparts. More substantial percentage differences exist when we look at the association between the average number of student class periods devoted to advanced classes. However, these differences are also not statistically significant.

...schools with mixed or low-minority student populations have consistently increased the average number of student class periods devoted to advanced classes...

Although the differences between cohorts are not statistically significant, policymakers may gain some useful insight by examining the course-taking patterns of each group. As figure 6 shows, the trend in advanced course-taking has not been the same for high minority schools and schools with low or mixed portions of students of color.

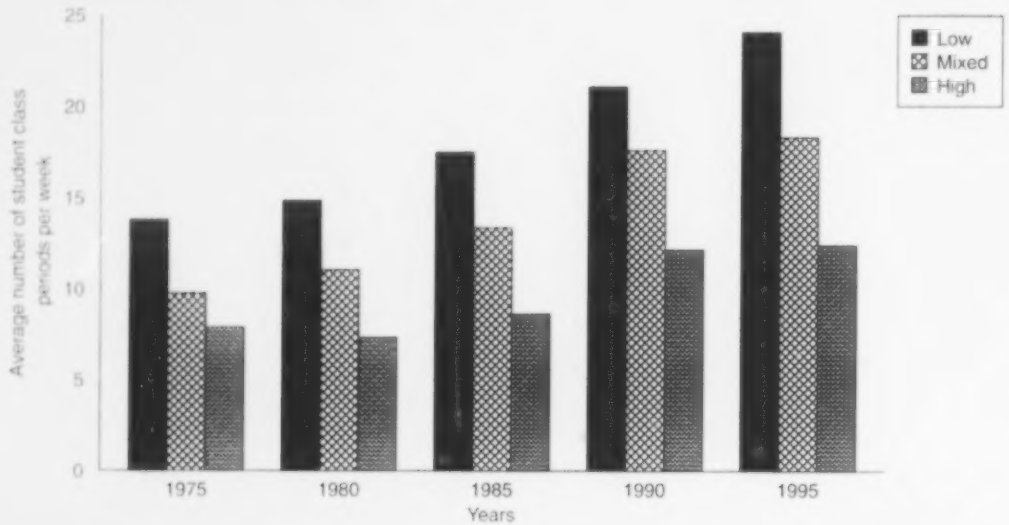
Prior to 1985, there seems to be a rising trend in the average number of student class periods devoted weekly to advanced classes for all ethnic categories of schools. By 1985, a dramatic "turnaround" takes place in schools with high portions of high minority students. The average number of student class periods devoted weekly to advanced courses falls from a high of 0.43 in 1985 to a low of 0.16 student class period in 1990. This number has increased slightly to 0.18 of a student class period in 1995. By sharp contrast, schools with mixed or low-minority student populations have consistently increased the average number of student class periods devoted to advanced classes over the 20 years of the study. On average, the time devoted to advanced classes in low-minority schools increased from 0.35 in 1975 to almost 1.2 in 1995. Similarly, the average number of student class periods devoted weekly to advanced courses in schools with mixed populations rose from 0.38 in 1975 to 0.92 in 1995.

Question 3: Potential role of public policy in shaping course-taking behavior

Even after looking at the descriptive relationship between the ethnic and poverty profiles of schools, some questions remain regarding the role of public policy in course-taking behavior. For instance, does the ethnic profile of schools have a less substantial association with curriculum standards in the periods following reform than in periods prior to reform? If reform policies are effective, we would expect this to be the case. Using weighted regression, this paper looks more closely at the association between measures of student charac-

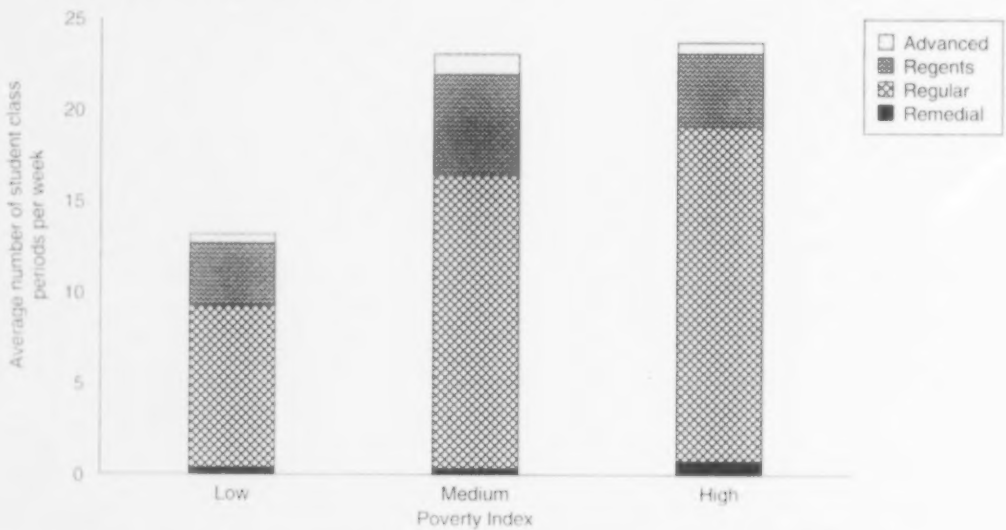
[7] The discussion is based on a two-tailed t-test with a cut-off level of $\alpha = 0.05$.

Figure 4.—Association between portion minority and average number of student class periods allotted to a core curriculum: School years 1974–75 through 1994–95



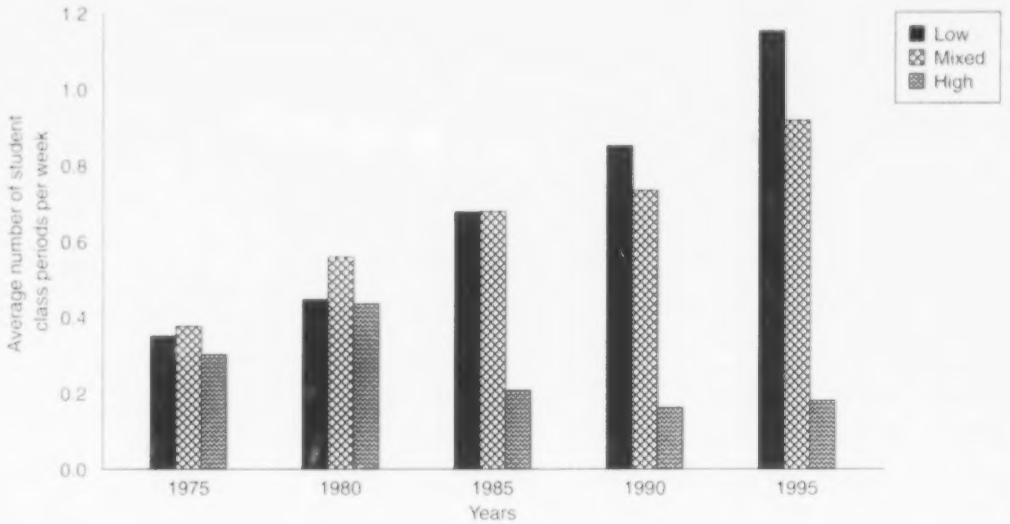
SOURCE: Diagrammatic representation using Excel based on univariate analysis conducted on relevant data from the New York State Basic Education Data System and those compiled by author.

Figure 5.—Association between lunch participation rate and average number of student class periods allotted to a core curriculum: School years 1974–75 through 1994–95



SOURCE: Diagrammatic representation using Excel based on univariate analysis conducted on relevant data from the New York State Basic Education Data System and those compiled by author.

Figure 6.—Association between portion minority and average number of student class periods allotted to advanced courses: School years 1974–75 through 1994–95



SOURCE: Diagrammatic representation using Excel based on univariate analysis conducted on relevant data from the New York State Basic Education Data System and those compiled by author.

teristics and curriculum standards, holding other things constant.

To explore the role of state policy in course-taking, the long-term association between curriculum standards, the ethnic profile and size of schools, and curriculum policy initiatives in New York State are examined. Curriculum standards and ethnic profile (PMIN) are as described above; note that PMIN is a continuous variable. Size (HIGHT) is represented by the number of students enrolled in grades 9 through 12. Policy initiatives are captured by dummy variables and reflect the period before imposition of the Regents Action Plan in 1984, the period between reforms, and the period after the New Compact for Learning (NCL) in 1991. Thus, PRERAP is coded 1 for 1975 and 1980, and coded 0 otherwise. PRENCL is coded 1 for 1985 and 1990, and coded 0 otherwise. The period after imposition of both policy initiatives is the base year; that is, 1995. To explore the changes in the association between the ethnic profile of schools in different policy periods, interaction variables between PMIN and PRERAP (PRAPMIN), as well as between PMIN and PRENCL (PNCLMIN), were created. The coefficients of these interaction variables indicate the association between curriculum standards and the percentage of black and Latino students in schools during the specified period. The models of curriculum standards are:[8]

[8] These models determine the partial correlation between selected variables and the two measures of curriculum standards; they are not behavioral models.

$$NWCORE = \alpha + \beta_1 PMIN + \beta_2 HIGHT + \beta_3 PRERAP + \beta_4 PRENCL + \beta_5 PMINRAP + \beta_6 PMINNCL + e$$

$$NWADV = \alpha + \beta_1 PMIN + \beta_2 HIGHT + \beta_3 PRERAP + \beta_4 PRENCL + \beta_5 PMINRAP + \beta_6 PMINNCL + e$$

Table 3 shows the estimates derived for the models of curriculum standards. Even when the ethnic profile and size of schools are controlled for, the reform periods are still significant for the average number of student class periods weekly allotted to the core. For instance, there are significantly smaller numbers of student class periods devoted to the core in the time before any of the specified curriculum reforms than in the time after the New Compact for Learning. Similarly, the pre-reform era has significantly less time devoted to advanced courses than the period after imposition of the NCL. The differences between the pre-reform period and PRENCL are not significant on either measure of curriculum standards.

Prior to the implementation of the Regents Action Plan, higher portions of minority students were significantly associated with larger numbers of student class periods devoted to the core. By contrast, in the period between reforms, the association between portions of minority students and the time allotted to the core was negative. However, this association was not statistically significant at $\alpha = 0.05$.

Prior to the implementation of the Regents Action Plan, higher portions of minority students were significantly associated with larger numbers of student class periods devoted to the core.

The association between the minority population of schools and the average number of student class periods allotted to advanced classes is less after the NCL than in prior years. However, this difference is significant only in the time preceding implementation of the Regents Action Plan. There are no significant differences between the pre-reform period and the period between policies.

Despite reform efforts, the size and ethnic profile of schools are significantly associated with both measures of curriculum standards. That is, the smaller the school size and the higher the portions of minority students, the fewer student class periods are devoted to the core. Similarly, the portion of minority students is also negatively associated with the average number of student class periods allotted to advanced courses. However, larger schools are associated with more classes devoted to an advanced curriculum than their smaller counterparts.

The model of curriculum standards explains more of the variation in the average number of student class periods weekly devoted to the core than it does the number of student class periods allotted to advanced learning (41.7 percent versus 15.7 percent). This suggests that there is a stronger link between the policy initiatives of New York State and the subjects in a curriculum than there is between these directives and the rigor of the courses taken.

Discussion

This 20 year analysis has documented a number of encouraging trends:

- more student class time is devoted to core courses
- more student class time is devoted to advanced courses
- less student class time is spent on remedial material
- mathematics and science classes are increasingly emphasized

These findings are positive, especially if we assume a link between course-taking behavior and student attainment. However, the analysis also reveals areas in which more work needs to be done.

Table 3.—Association between curriculum standards and ethnicity, school size, and reform initiatives: School years 1974–75 through 1994–95

	Average number of student class periods in core	Average number of student class periods in advanced
constant	21.7852*	0.7998*
	(0.1636)	(0.0159)
pmin	-5.1466*	-0.6293*
	(0.3162)	(0.0308)
size	-0.0024*	$2.984\ 10^{-5}$*
	$^{-5}(7.563)10^{-5}$	$(7.37)10^{-6}$
prerap	-4.714*	-0.4782*
	(0.2420)	(0.0236)
prencl	1.7216*	-0.0863*
	(0.2658)	(0.0259)
prerap*pmin	3.2124*	0.4952*
	(0.5911)	(0.0576)
prencl*pmin	-0.1002	0.056
	(0.5829)	(0.0568)
n (DF)	4369 (6, 4363)	4369 (6, 4363)
adj R^2	0.4167	0.1572
F value	521.183	136.847
Prob>F	0.0001	0.0001

* These findings are significant at 0.05.

NOTE: Numbers are multiplied by 10 to the negative X, i.e., $7.563^{-5} = 7.563 \times 10^{-5} = 00007.563$.

SOURCE: Alexander, Nicola, unpublished tabulations. Results of conducting multivariate analysis on relevant data from the New York State Basic Education Data System using SAS.

The significant association between curriculum standards and the size and ethnic profile of a school suggests that where a child attends school may have an adverse effect on the quality of the curriculum he/she receives. Further, the decline in the average number of student class periods allotted to advanced courses in schools with high minority student populations is a cause for concern. The timing of this decline implies that the Regents Action Plan may have had some unforeseen impact on these type of schools. The result of this "backwash" may have caused the overall increase in advanced learning to come at the expense of schools with high minority populations.

In sum, in New York State where curriculum standards have had a long history, there is little variation in the time assigned to the core. This implies that state constraints in required subject areas constrain the emergence of large differences in subject area patterns between schools with different socioeconomic and ethnic profiles. However, state education policies do not seem to be as binding in the area of advanced learning, where more variation across schools is apparent.

This implies that existing curriculum standards are mainly reaching one variable in the "standards" equation—subject matter. Perhaps, this explains the

recent decision by the New York State Board of Regents to require a more challenging curriculum in English, mathematics, social studies, and science in order to graduate from high school. If the findings of Altonji (1994) that *additional* courses do not have a substantial effect on educational or labor outcomes are accurate, then requiring mastery of the core curricula rather than focusing only on additional courses is an appropriate policy.

Ultimately, these findings suggest that we need to design standards carefully so that we are not merely giving a new name to the *status quo*. Further studies are needed to determine whether the difference in course-taking patterns is meaningful; in other words, does differential course-taking make a real difference in outcomes? If these changes are not meaningful, then we are not truly addressing the concerns of at-risk communities. Finally, while the results of this study imply that there is a role for standards in the educational arena, more detailed analysis is needed to determine just what that role is.

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Court-Ordered School Finance Equalization: Judicial Activism and Democratic Opposition

Douglas S. Reed
Georgetown University
Washington, DC

About the Author

Dr. Douglas S. Reed is an Assistant Professor in the Government Department at Georgetown University. He teaches both American politics and Constitutional Law and his research interests broadly focus on courts and social movements with an emphasis on the political and constitutional meanings of equality. His recent work has centered on educational equality and legal institutions, with a focus on state supreme court interventions in public school finance.

A former Research Fellow at the Brookings Institution in Washington, DC, Dr. Reed earned his Ph.D. in Political Science from Yale University in 1995. His dissertation, titled, *Democracy v. Equality: Political and Legal Struggles over School Finance Equalization*, examined the impact of state supreme court decisions on school finance in Connecticut, Kentucky, New Jersey, and Texas. His most recent article, "The People v. The Court: School Finance Reform and the New Jersey Supreme Court," appeared in the *Cornell Journal of Law and Public Policy*.

During the 1996–97 school year, Dr. Reed received a Spencer Post-Doctoral Fellowship from the National Academy of Education and is writing a book on courts and educational reform.

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Court-Ordered School Finance Equalization: Judicial Activism and Democratic Opposition

Douglas S. Reed
Georgetown University

Recent United States Supreme Court decisions have brought nearly to an end the era of judicially-supervised school desegregation and integration. Over a series of decisions, the Supreme Court has sought recently to disengage the federal judiciary from close oversight of local school districts, especially in the realm of racial segregation.[1] But the judiciary's involvement in educational matters is far from negligible. Undaunted by the federal judiciary's experience with school desegregation—and perhaps even inspired by it—state courts have over the past twenty years embarked on their own efforts to effect dramatic changes in public education. These efforts have focused not on racial segregation but on the financing disparities among school districts.[2] Since the U.S. Supreme Court ruled in *San Antonio Independent School District v. Rodriguez* (1973) that school financing inequities do not violate the equal protection clause of the Fourteenth Amendment, state supreme courts in 27 states have ruled on school financing suits under provisions of state constitutions. Twelve have ruled in favor of greater equity and fifteen have ruled against it (see table 1). Part of a larger trend of using state courts for the protection of civil rights under state constitutions,[3] these school finance decisions have the potential dramatically to alter the fiscal policies of numerous state governments—with enormous consequences for both the amount of resources allocated to public education and the equity of that distribution. Legal

[1] See *Missouri v. Jenkins*, *Freeman v. Pitts*, and *Board of Education of Oklahoma City v. Dowell*.

[2] The leading cases are *Robinson v. Cahill* (Robinson I), *Serrano v. Priest* (Serrano II), *Horton v. Meskill* (Horton I), *Dupree v. Alma School District*, *Edgewood Independent School District v. Kirby* (Edgewood I), *Helena Elementary School District No. One v. State of Montana*, *Rose v. Council for Better Education*, and *Abbott v. Burke* (Abbott II).

[3] For background on this trend, see Brennan (1977); Howard (1976); Pollock (1985); Williams (1985); Williams (1992). This trend towards increasing use of state constitutions has not gone uncriticized, however. See, for example, Gardner (1992).

Table 1.—State Supreme Court decisions on school finance

State Supreme Courts ruling in favor of greater equity and/or adequacy	Court cases supporting this ruling
California	*Serrano v. Priest* (Serrano I)[1] *Serrano v. Priest* (Serrano II)[2]
New Jersey	*Robinson v. Cahill* (Robinson I) *Abbott v. Burke* (Abbott II)
Montana	*State ex. rel. Woodahl v. Straub*[3] *Helena Elementary School District No. One v. State of Montana*[4]
Connecticut	*Horton v. Meskill* (Horton I) *Horton v. Meskill* (Horton III)[5]
Washington	*Northshore School District No. 417 v. Kinnear* *Seattle School District No. One v. State of Washington*[6]
West Virginia	*Pauley v. Kelly*
Wyoming	*Washakie County School District No. One v. Herschler*
Arkansas	*Dupree v. Alma School District No. 30 of Crawford County*
Kentucky	*Rose v. Council for Better Education*
Texas	*Edgewood Independent School District v. Kirby* (Edgewood I)
Tennessee	*Tennessee Small School Systems v. McWherter*
Massachusetts	*McDuffy v. Secretary of the Executive Office of Education*
New Hampshire[7]	*Claremont School District v. Governor*
Kansas[8]	*Unified School District No. 229 v. State*
Arizona[9]	*Roosevelt Elementary School District No. 66 v. Bishop*
Vermont	*Brigham v. State*
Ohio	*DeRolph v. State*

Table 1.—State Supreme Court decisions on school finance, continued

State Supreme Courts ruling against greater equity and /or adequacy	Court cases supporting this ruling
Illinois	*Blase v. State*
Arizona	*Shofstall v. Hollins*
Michigan	*Milliken v. Green*
Idaho	*Thompson v. Engelking*
Oregon	*Olsen v. State ex. rel. Johnson* *Coalition for Equitable School Funding v. State*
Wisconsin	*Buse v. Smith*[10] *Kukor v. Grover*[11]
Pennsylvania	*Danson v. Casey*
Ohio	*Board of Education v. Walter*
Georgia	*MacDaniel v. Thomas*
New York	*Board of Education Levittown Union Free School District v. Nyquist*
Colorado	*Lujan v. Colorado State Board of Education*
Maryland	*Hornbeck v. Somerset County Board of Education*
Oklahoma	*Fair School Finance Council of Oklahoma, Inc. v. State*
North Carolina	*Britt v. North Carolina State Board of Education*
South Carolina	*Richland County v. Campbell*
Minnesota	*Skeen v. State*
Nebraska	*Gould v. Orr*
North Dakota[12]	*Bismark Public School District #1 v. State*

Table 1.—State Supreme Court decisions on school finance, continued

Maine	*School Admnistrative District No. 1 v. Commissioner, Department of Education*
Rhode Island	*City of Pawtucket v. Sundlun*
Florida	*Coalition for Adequacy and Fairness in School Funding v. Chiles*
Illinois	*Committee for Educational Rights v. Edgar*

[1] Serrano I was based on federal grounds held to be invalid under Rodriguez.

[2] Serrano II was based on state constitutional provisions.

[3] State ex. rel. *Woodahl v. Straub* found that a modest equalization scheme was constitutional.

[4] *Helena Elementary School District No. One v. State of Montana* found the existing scheme unconstitutional.

[5] School finance plaintiffs won in Horton I, but Horton III imposed a more demanding burden of proof for plaintiffs' claim concerning the adequacy of reform.

[6] *Northshore School District No. 417 v. Kinnear* did not rule in favor of greater equity, *Seattle School District No. One v. State of Washington* overturned much of Northshore.

[7] The New Hampshire Supreme Court has not yet ruled on the merits, but it has declared both an adequate education and adequate funding a constitutional right in New Hampshire.

[8] *Unified School District No. 229 v. State* ruled that a redistributive scheme established by the state legislature was constitutional. The suit was brought by districts that lost revenue under the plan.

[9] The *Bishop* decision concerned only the funding of school facilities.

[10] *Buse v. Smith* declared unconstitutional a highly progressive funding mechanism that re-distributed tax revenues across districts. The suit was brought by districts that had to pay the tax.

[11] *Kukor v. Grover* held constitutional a moderately egalitarian funding mechanism that plaintiffs felt did not provide sufficient revenues for inner-city districts.

[12] By a 3-2 vote, North Dakota's Supreme Court ruled against the existing financing system, but under North Dakota's Constitution, four justices are required to declare a law unconstitutional.

NOTE: The table here and Hickrod et al. differ somewhat due to different definitions.
SOURCE: Reed, unpublished tabulations; Hickrod, G. A. et al. 1997. "Status of School Finance Constitutional Litigation—The Boxscore." Illinois State University, College of Education.

scholars have given these state supreme court decisions fairly wide notice,[4] but little attention has been paid to the impacts of these decisions. The political science and policy communities have also given scant attention to the impact of these decisions. One exception is Michael Mintrom's report in 1993. Another policy study, Hickrod et al. (1992), directly assesses the effects of state supreme court decisions across a number of states. Unfortunately, this study is marred by some significant methodological problems. First, the school finance figures are not adjusted for inflation; only constant figures are used. Also, as the article compares data over a fairly long time span, 1970–1990, inflation could account for much of the increase in educational expenditures by state and local government. Second, measures of school financing equity are used that precede state supreme court decisions in Kentucky, Montana, Texas, and New Jersey. These data, then, cannot be used to evaluate

[4] See Banks (1992); Johnson (1979); Thro (1989); Thro (1990).

whether the courts changed the distribution, and hence the equity, of funds.

This paper attempts to rectify this imbalance in both the political science and policy literature on school finance. I do so by examining two ways these decisions affect the policies and politics of state governments. First, I want to examine the effects of these state supreme court decisions on the actual distributions of school funds within four states. In short, this paper assesses the success of efforts by four state supreme courts (Connecticut, New Jersey, Texas, and Kentucky) to increase the equity of school finance within their states. Second, I also want to explore the dimensions of public reaction to these decisions, by analyzing polling results and voting returns. This examination of public reactions to the court decisions and the legislative remedies designed to comply with judicial mandates will, I hope, highlight the opportunities, limitations, and constraints that operate on state supreme courts as they strive to effect significant changes in the ways public schools are financed.

My argument is twofold: First, I argue that there has been important variation in the changes wrought by state supreme courts in the four states I study. Some state supreme courts have achieved a great deal of equalization, while others have been less successful. Second, I argue that public opposition to equalization efforts is often keen, but its determinants are not straightforward. Economists would contend, and have,[5] that the opposition to equalization stems from economic self-interest to avoid costs. But my analysis below of polling data from New Jersey and election returns in Texas shows that a significant portion of the opposition in both those states is racial or ideological rather than simply driven by perceived economic self-interest.

This conclusion, I contend, has profound consequences for how both judges and legislators approach the issue of school finance equalization. In short, devising a school finance system that distributes economic costs widely and fairly may not be enough; judges and policymakers will still have to overcome racial and ideological cleavages. The former results from the perception that racial minorities are the beneficiaries of equalization. The latter emerges from those who value localist rather than state-centered approaches to school financing—even if the localist approach generates persistent and significant inequality of resources.

...this paper assesses the success of efforts by four state supreme courts (Connecticut, New Jersey, Texas, and Kentucky) to increase the equity of school finance within their states.

Rather than simply confronting interest groups that articulate economic, class-based arguments against equalization, legislatures (and, in turn, state courts) must battle against a mass public opposition to equalization that is, in significant ways, racially based. This paper examines the quantitative effects of court-ordered school finance equalization in four states, and then turns to an analysis of public opinion concerning school finance equalization in two states where supreme courts have been particularly active: Texas and New Jersey. The New Jersey Supreme Court has achieved significant and important reforms in school finance for that state, but at a fairly high political cost. In Texas, meanwhile, the results have been less favorable for the advocates of increased equity, and opposition has been extremely strong. In both cases, I examine the public opinion surrounding the legislature's policy response to the school finance decisions.

[5] Campbell and Fischel (1996) contend that economic rationality drove voter opposition to a gubernatorial candidate who sought to comply with a state supreme court decision with an income tax-funded equalization plan—even though most taxpayers would financially benefit from equalization.

This paper is organized into three sections. The first section presents a quantitative assessment of the effects state supreme courts in Connecticut, New Jersey, Texas, and Kentucky have had on equality of school finance expenditures. The second section shifts the focus to New Jersey and Texas and examines the determinants of public opposition to the legislative responses to the Supreme Court decisions. Finally, the third section concludes with some observations about the limitations of both judges and legislators as they strive to address the problem of school finance inequities.

How Have State Supreme Courts Affected Educational Financing Equity?

In this section, I provide an overview of the trends in school finance equity in the wake of state supreme court decisions that declared existing methods of financing schools unconstitutional.

At this juncture, it is necessary to provide a quick word about school finance data and the notion of expressing "equality" through quantitative data. There are a number of ways to measure the equity within a school finance system and they all embody certain value choices about what is worthy of measurement. Put simply, different measures reflect different normative commitments. One cannot provide an "objective" notion of equality because there are different types of equality.[6] For the sake of simplicity, I have chosen to provide here only one basic measure: the coefficient of variation, which is the standard deviation of a population divided by the mean of the population. This calculation measures the dispersion of expenditures across districts within a state. It is a quantitative representation of what Berne and Stiefel (1984) call "horizontal equality," the notion of providing all similarly situated students with equal amounts of educational resources, measured here by dollars.

...[H]orizontal equality," [is] the notion of providing all similarly situated students with equal amounts of educational resources....

Quantitative Analysis

I obtained school financing data for each school district within each state, and calculated the per pupil expenditures in a number of categories. These data generally came from the state departments of education, although Connecticut data was obtained from the Connecticut Public Expenditure Council, a well-regarded fiscal watchdog group. Also, because the New Jersey decision was restricted to only particular socio-economic classes of school districts, I have applied my analysis only to those districts that are the focus of the court's ruling: the 30 so-called "special needs" districts, largely inner-city districts, and the roughly 110 affluent districts that fall into the New Jersey Department of Education's "I" and "J" categories of district wealth (the two most affluent categories). I weighted each district for the number of students within that district in order to obtain a per pupil rather than a per district analysis. After adjusting the figure for inflation, I then calculated the coefficient of variation (dividing the standard deviation by the mean).[7]

[6] For a discussion of the types of equality see Rae et al. (1981). For a discussion of how measuring the different types of equality necessarily requires the exercise of value judgements see Berne and Stiefel (1984).

[7] Because states use different accounting methods and expenditure definitions, it is not possible to compare directly expenditure and revenue categories across states. Consequently, I have had to use different categories of expenditures, or revenues, in each state. Therefore, one cannot compare equities *across* states—for example, that Kentucky's funds are distributed more equitably than Texas'. These figures *are* useful for determining trends in equity within a state over time. This way we can determine whether a particular state supreme court has been more effective than another in its efforts to promote school finance equity.

Figures 1-4 present the results of the equalization efforts in four states: Connecticut, New Jersey, Texas, and Kentucky. In each figure, we see the trends of school finance equity over time, as measured by the coefficient of variation. The line in each chart shows the equity change in the expenditures or revenues of districts in each state. In order to determine whether the state supreme court decisions had an effect on the equity of these expenditures, we need to determine whether the line slopes downward. In all four states, the lines slope downward after the state supreme court decision.[8] But the size of the changes and the permanence of the equalizing trend vary significantly from state to state. In figure 1, Connecticut only saw a slight dip in its overall inequities and then a gradual worsening of the inequalities. Within six years, inequities were actually *worse* than they were at the time of the court's decision. Similarly, in figure 2, Texas saw only a gradual and modest decline in the level of school financing inequities—despite the Texas Supreme Court's deep and repeated involvement in the matter. In contrast, in figure 3, New Jersey saw the equity of funds available to "special needs" and affluent, suburban districts increase rather dramatically since the 1990 decision.[9] Finally, we see in figure 4 that Kentucky saw its inequities cut almost in half over a four year period. Kentucky's improvement in equities are clearly the most substantial of the four states examined here.

...school finance decisions in some states ultimately produce much greater equity than they do in other states.

Implications of Quantitative Findings

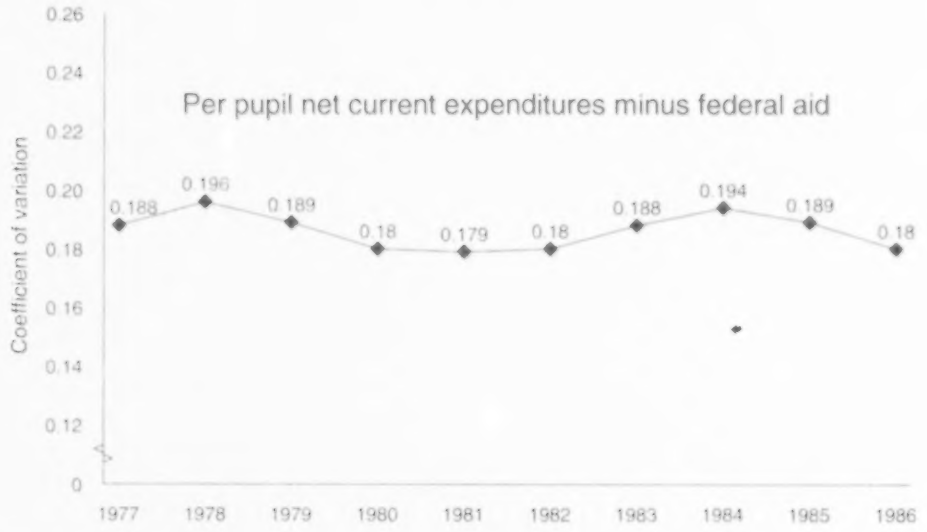
We see, then, that school finance decisions in some states ultimately produce much greater equity than they do in other states. What accounts for this difference? What contexts render some decisions more effective than others? Or, to put it in a language that is more fashionable in political science: What are the limitations on state supreme courts' judicial capacities—at least within the policy arena of school finance?

In order to respond to these questions, we need to understand the pressures operating on state supreme courts and the institutional contexts within which they must act. In their work *State Supreme Courts in State and Nation*, Tarr and Porter present a broad analytical framework for the study of state supreme courts, a framework which sketches the institutional and jurisprudential opportunities and limitations of state supreme courts. In table 2 I have adapted their framework to the concrete legal and policy setting of school finance litigation. Although Tarr and Porter do not present their conception of judicial federalism in a tabular form, their analytical understanding of the vertical, horizontal, and intra-state linkages of state supreme courts, combined with the legal and extra-legal contexts of state courts within the American policy, lends itself to the following two by three matrix. Within each cell, I provide only one example of numerous possible relationships or activities that affect a state supreme courts' foray into school finance reform. Table 2 is not designed to be a comprehensive listing of all possible state supreme court relations and contexts, but rather an analytical

[8] The decisions were delivered in the following years: Connecticut, 1977; Texas, 1989; New Jersey, 1989; Kentucky, 1990. The New Jersey Supreme Court handed down a decision in 1973 that triggered an earlier round of school financing changes in that state. For an overview of the politics and results of those changes, see Goertz (1983); Goertz (1979); and Lehne (1978).

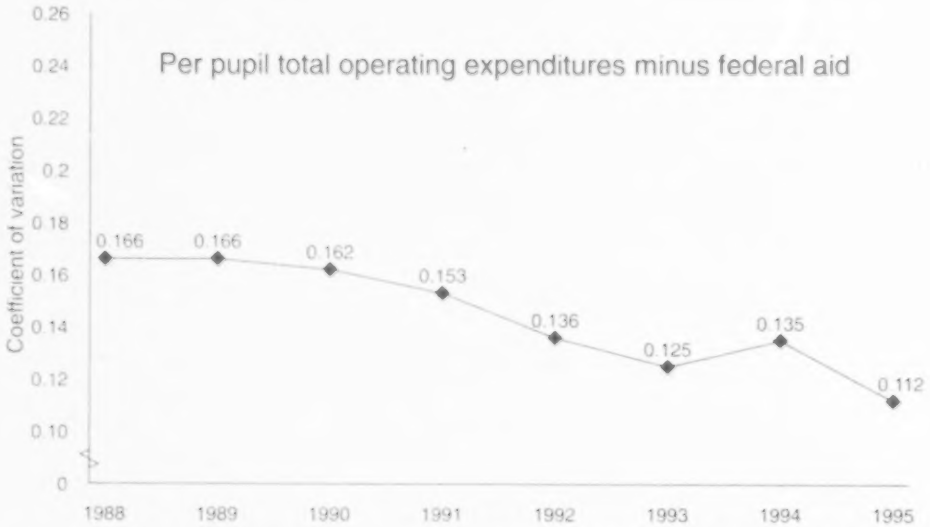
[9] The New Jersey Supreme Court confined the scope of its decision to two specified types of school districts within the state: approximately 30 "special needs" districts which are largely urban districts and roughly 110 affluent, suburban districts. In my analysis, I have only included those districts that were included within the court's decision. The equity trends shown here only demonstrate the degree to which these districts have become more equitable. It does not address the equity of all districts within the state.

Figure 1.—Coefficient of variation for Connecticut school districts: School years 1977–86



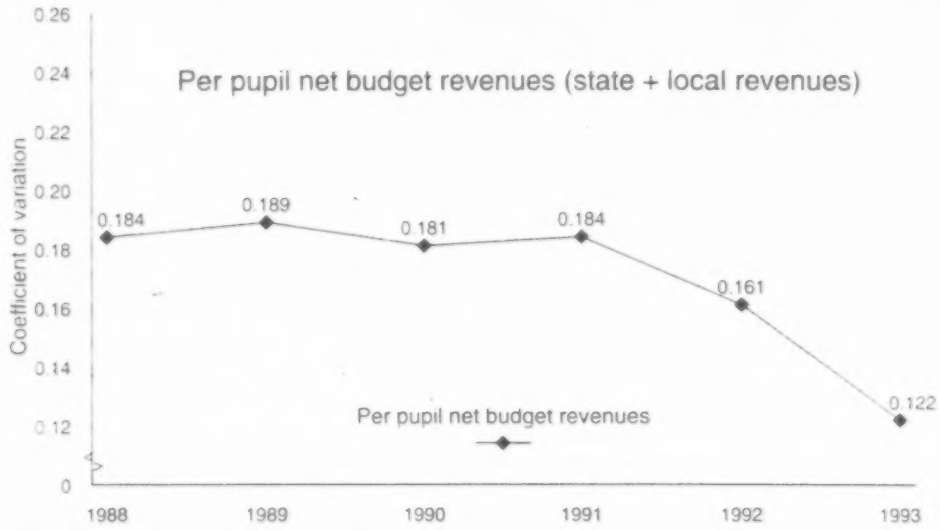
NOTE: K–12 districts; Thomaston figures omitted for 1978–79 due to exceptionally high federal aid. All values weighted for district enrollment and expressed in constant 1986 dollars.
SOURCE: Connecticut Public Expenditure Council Annual Reports, 1977–86.

Figure 2.—Coefficient of variation for Texas school districts: School years 1988–95



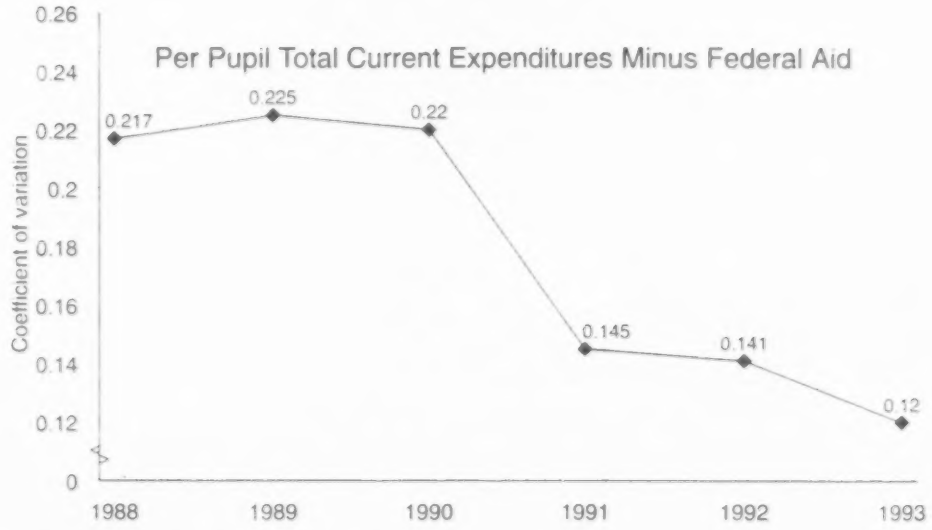
NOTE: K–12 districts with at least 100 students. For 1994, Benavides and Lancaster ISDs omitted due to erroneous data. All values weighted for district enrollment and calculated in 1993 dollars.
SOURCE: Texas Education Agency. Austin, Texas. March 1994 and July 1996.

Figure 3.—Coefficient of variation for New Jersey's special needs and I & J districts: School years 1988–93



NOTE: K–12 and hypothetical K–12 districts constructed from regional high schools, K–8, and K–6 districts. All values weighted for district enrollment and calculated using 1993 dollars.
SOURCE: New Jersey Department of Education, January 1994. 1993 figures are preliminary.

Figure 4.—Coefficient of variation for Kentucky school districts: School years 1988–93



NOTE: All values weighted for district enrollment and calculated using constant 1993 dollars.
SOURCE: Kentucky Department of Education, March 1994.

Table 2.—State supreme courts' activities and institutional relations in school finance litigation

	Column A Legal contexts	Column B Extra-legal contexts
Vertical relations	*San Antonio v. Rodriguez*	U.S. Department of Education
Horizontal relations	Decisions of sibling states	National Governors' Conference
Intra-state relations	School finance ruling itself	Legislative and political pressures re-taxation and school reform

SOURCE: Adapted from Tarr and Porter, (1988).

schema to help us identify various roles and contexts in which a state supreme court *might* operate within the policy realm of public school finance.

In column A, we can trace the setting and influence of U.S. Supreme Court and other state supreme court decisions on an individual state supreme court's decision. In Column B, we see the effects of extra-legal relations and contexts on school finance reform. Not all cells are of equal importance, but a full account of the Connecticut, Texas, New Jersey, and Kentucky case studies would closely examine the interaction between the last two cells in Columns A and B. A full account would, that is, demonstrate the effects that both legal and extra-legal contexts have on school finance reform within each state. It is here that we can begin to identify the sources of relative judicial capacity or incapacity in the realm of public school finance. And it is here that perhaps we can find some answers to the question of why some state supreme court decisions yield dramatic results and others meager results.

Unfortunately, a full reckoning of these case studies is beyond the scope of this paper. Instead, I turn next to merely *one* of the extra-legal factors that arguably has an influence on state supreme courts' capacity to restructure public school finance: mass public attitudes. My account here focuses on Texas and New Jersey. This examination can provide some insight on how courts can and cannot thwart majority will—especially in a climate where legislatures are particularly attuned to the attitudes of their constituents.

Determinants of Mass Public Opposition to School Finance Reform in Texas and New Jersey

In this section, I examine public attitudes towards school finance reform expressed in New Jersey and Texas at the time of major reforms in their public school finance systems. In New Jersey, I analyze data from a public opinion poll conducted by the Eagleton Institute of Politics in July of 1990, a few weeks after the legislature passed the Quality Education Act (QEA) of 1990, a reform package enacted in response to the New Jersey Supreme Court's decision in *Abbott II*. In Texas, I analyze voting returns and demographic data from state legislative districts to discern the demographic characteristics most strongly associated with opposition to Proposition One, a 1993 statewide constitutional referendum on school finance reform. This ballot measure was the consequence of three state supreme court decisions striking down the existing school finance arrangements in Texas. Both analyses show that race—in limited contexts—is salient to the issue of court-ordered school finance reform.

Theories of Opposition to School Finance Reforms

This analysis of public opinion posits three possible explanations for public opposition to school finance reform: economic self-interest, an anti-tax ideology, and racial geography. The three are explicated below.

1. **Economic Self-Interest:** The first, and probably the most commonly accepted understanding of opposition to school finance reform is simply one of economic self-interest.[10] Under this theory, opposition to reforms would emerge from the potential costs that court-ordered school finance equalization might bring: increased taxes and/or lower state aid to a district. Typically, individuals who live in affluent suburbs receive the shorter end of two sticks in school finance reform: their school districts receive less state aid and they have to pay more in state taxes, and possibly increased local taxes as well. Because of the zero-sum nature of school finance equalization, economic self-interest would dictate that the financial losers in school finance reform would oppose the reform effort.

2. **Anti-Tax and/or Anti-Government Ideology:** A second model that might explain opposition to the court-ordered reforms is an ideological one. Similar to, but distinct from an economic self-interest model, an anti-tax sentiment model could account for much of the opposition—independent of whether one's own district gains or loses aid or independent of whether one's own tax bill goes up or down. This could be particularly true if the sentiment is conjoint with an overall conservative ideological bent.

The first, and probably the most commonly accepted understanding of opposition to school finance reform is simply one of economic self-interest.

3. **Racial Geography:** A third model I test is a racial geography model: the effects of race and geographic location on one's likelihood to support or oppose both the court-ordered school finance reform. The rationale of this model is that anti-urban sentiment in the suburbs and rural areas combines with the perception that non-whites are the sole beneficiaries of school finance equalization to yield a white/non-white and urban/suburban-rural cleavage over the issue of school finance equalization. In some ways, this is a test of the racial politics of entitlements described by Edsall and Edsall (1992), but on a local rather than national level.[11]

New Jersey Public Opinion and the Quality Education Act of 1990

The citizens of New Jersey in 1990 were of two minds concerning the equity of school financing: the principle of greater equity was largely endorsed by a majority of respondents, but the specific policies designed to achieve that equity were simultaneously opposed by respondents. The purpose of this section is to analyze in detail the dimensions of New Jersey public opinion about the QEA. In early June 1990, The *Star Ledger*/Eagleton Poll queried 800 residents of New Jersey about their support for the school financing plan enacted by the New Jersey legislature a few weeks earlier. The data are in an SPSS portable file which was analyzed using SPSS/PC+. It contains 800 observations and 157 variables, encompassing not only the usual socio-economic demographics but also responses to questions about the perceived impact of new taxes, the perceived effects of school finance reform on local districts, whether the respondent has school-age

[10] See Bogart and Vandoren (1993) and Mintrom (1993).

[11] I am not examining the racial *affect* of respondents, but their racial identity, and then estimating the likelihood that they will oppose school finance equalization. The difference is important because if one is to argue that racial prejudice drives this opposition then one needs a further measure of racial affect—or other evidence of racial hostility. Evidence of a racial cleavage on this issue is not tantamount to evidence of racial prejudice. The former is a form of racial politics; the latter is a form of racism. The two—while both lamentable and, I contend, destructive—are different.

children, etc. The Eagleton Poll weights all observations to improve sample selection, ensuring that age and education frequencies correspond to U.S. Census data for New Jersey, by using an iterative raking algorithm. I collapsed the response I use here as a dependent variable: An approval/disapproval question concerning the QEA. I also collapsed a number of independent dummy variables into dichotomous approval/disapproval or polytomous responses. I then performed a logit analysis of dichotomous approval/disapproval responses to the QEA.

By testing three theories of opposition to the QEA and controlling for the influence that the presence of school-age children have on respondents' answers, I conclude that whites and non-whites in New Jersey perceive school financing differently if they have school age children. But among people without children, race does not shape one's perception of school financing; instead, economic costs are more salient to one's support, or lack thereof, of school finance reform.

The Eagleton Poll weights all observations to improve sample selection.

On a descriptive level, it is clear that in 1990 there was significant support for greater equity in school financing and an equally significant *lack* of support for the Quality Education Act (QEA I). *The Star-Ledger*/Eagleton Poll—taken between July 2 and 10, 1990—showed that 54 percent of those who had heard of *Abbott v. Burke* agreed with the decision (either mildly or strongly) and 38 percent of those aware disagreed with the court. (again, either mildly or strongly). The remaining 8 percent did not know their position. In contrast, only 35 percent of those surveyed approved of the recently passed QEA. Fifty-six percent disapproved, and 9 percent indicated they didn't know.[12] But what *accounts* for this level of support—or lack of it? By using a logistic regression technique on the original *Star-Ledger*/Eagleton Poll data set, we can estimate the influence of a number of independent variables on the inclination of a respondent to favor the QEA.

Operationalizing the Models for New Jersey Data

1. Economic Self-Interest

The poll contains a number of questions directly related to the perceived economic impact of both the school finance reform package and the income and sales taxes levied in part to pay for it. Specifically, respondents were asked whether they thought the tax package would hurt, have no effect or help "people like you" (EFFECT); whether they thought property taxes would go up, stay the same, or go down (PROPTAX), whether they thought their local school district would lose aid or get aid (GETAID) and their income level, broken into four categories (INCOME2). I recoded EFFECT into a dichotomous (hurt vs. help/no difference) variable (EFFECT_R). Together, these four variables (EFFECT_R, PROPTAX, GETAID, INCOME2) comprise the economic rationality model.

2. Anti-Tax & Ideology

The poll also contains data on whether respondents accept an increase and expansion of the sales tax (SALESTAX), whether they accept an increase and expansion of the state income tax (INCTAX), and a ideological self-identification score, using the terms conservative, moderate and liberal (IDEOLOG). These three variables comprise the anti-tax and ideological model.

[12] Star Ledger/Eagleton Poll (1990).

3. Racial Geography

Using a racial self-identification variable, I collapse all non-Caucasian values into a "non-white" value, yielding a dichotomous white/non-white variable (RACE). For the geographic residence of the respondent, I employ the Eagleton's classification of municipalities into four varieties: center city, city and old suburb, new suburb, and rural, yielding a polytomous variable (TYPE). These two variables comprise the racial geography model.

Attitudes Towards the Quality Education Act of 1990

1. Attitudes of All Respondents

Table 3 shows the results of a logistic regression on the approval/disapproval responses using the three models described above, for all respondents.[13] This table shows that economic rationality heavily influenced attitudes towards the QEA. Only two independent variables—perceived loss or gain of aid to one's district and the perceived effect of the QEA on one's local property tax rates—are significant above 0.05; anti-tax sentiment and ideology do not appear to be significant.

[Table 3] shows that economic rationality heavily influenced attitudes towards the QEA.

But what is the *magnitude* of these relationships? In order to discern this, we need to look at the right hand side of table 3. A logistic regression requires a further interpretative step because the parameter estimate B is not equivalent to a regression coefficient. It represents, instead, the change in the log of the odds ratio of approving or disapproving the QEA, given a per unit increase of each particular independent variable. From this measure, however, we can calculate the *probability* that an individual will approve or disapprove of QEA, holding the values of the other independent variables constant at their means. This calculation for each variable is shown in the "Change in Probability" column of table 3.[14]

Upon examination, the change in probability column of table 3 shows that the magnitude of the effect of these two significant variables is rather large: a perception that one's property taxes will rise results in a 25 point drop in support for the QEA.[15] Similarly, a perception that the local school district will receive reduced state aid lowers one's approval rating by 15 points. Thus, we can say with reasonable assurance that economic rationality appears to most heavily influence the attitudes towards the QEA among all respondents.

2. Attitudes of Parents of Public School Children

It is important to be aware that all sub-groups might not regard the QEA with the same attitudes as the sample as a whole. Parents of school-age children, for example, might view the matter differently than non-parents or retired New Jerseyans. The section asks whether parents of school-age children make a calculation of economic self-interest when they evaluate the desirability of the QEA. The data shown in table 4 indicates that race and the type of municipality the respondent lives in are far more reliable predictors of support or opposition to the QEA than is economic rationality. Among parents of children enrolled in public schools, the race and the municipality of the respondent are the only

[13] For a brief and useful discussion of logistic regression techniques see Aldrich and Nelson (1984).

[14] This table and calculations follow the "first differences" formulas recommended by King (1989), pp. 107-108.

[15] The dependent variable was coded one for approval, two for disapproval; a positive parameter estimate, then, means a greater propensity to *disapprove* of the QEA.

Table 3.—Logistic regression of support for the Quality Education Act, all respondents, 1990

Variable	Parameter est. (B)	S.E.	Estimates/S.E.	Change in X (from, to)	Change in prob. of sig. variables
Race	0.0869	0.2669	0.33		
Central city resident	0.5022	0.2982	1.68		
Perceived effect of tax package	0.3346	0.2609	1.28		
Perceived loss or gain of school aid in local district**	0.6586	0.2551	2.93	(1,2)	-0.15
Perceived effect of QEA on local property tax rates*	0.5128	0.2167	2.37	(1,3)	-0.25
Income	0.0535	0.1041	0.51		
Accept an increase and expansion of sales tax	0.1440	0.2492	0.58		
Accept an increase and expansion of income tax	0.3000	0.2431	1.23		
Ideology	0.1521	0.1115	1.36		
Constant***	-4.6942	0.8870	-5.29		

N=439. Proportion predicted correctly = 68.54%. Distribution of dependent variable: Approve = 36.85%; Disapprove = 63.15%.

* Significant at >0.05.

** Significant at >0.005.

*** Significant at >0.0001.

NOTE: Change in probability of significant variables is the change in the probability that a respondent will approve of the Quality Education Act given the change in the independent variable that is specified in the change in X column, holding all the other independent variables constant at their means. See text for coding required to interpret change in X values.

SOURCE: Star Ledger/Eagleton Poll, July 1990 (Poll #: EP 79-4). Conducted by the Eagleton Institute, Rutgers University.

Table 4.—Logistic regression of support for the Quality Education Act, parents of children enrolled in public schools, 1990

Variable	Parameter est. (B)	S.E.	Estimates/S.E.	Change in X (from, to)	Change in prob. of sig. variables
Race**	1.3503	0.5097	2.65	(1,2)	-0.31
Central city resident*	-1.3254	0.6664	-1.99	(1,2)	0.23
Perceived effect of tax package	0.0689	0.5611	0.12		
Perceived loss or gain of school aid in local district	0.4578	0.5063	0.90		
Perceived effect of QEA on local property tax rates	-0.2480	0.4549	-0.55		
Income	-0.0420	0.2259	-0.19		
Accept an increase and expansion of sales tax	0.6571	0.5068	1.30		
Accept an increase and expansion of income tax	-0.2205	0.4960	-0.44		
Ideology*	0.4497	0.2267	1.98	(1,3)	-0.19
Constant	-0.7730	1.7185	-0.45		

N=116. Proportion predicted correctly = 70.99%. Distribution of dependent variable: Approve = 33.59%; Disapprove = 66.41%.
* Significant at <0.05. ** Significant at <0.01.
NOTE: Change in probability of significant variables is the change in the probability that a respondent will approve of the Quality Education Act given the change in the independent variable that is specified in the change in X column, holding all the other independent variables constant at their means. See text for coding required to interpret change in X values.
SOURCE: Star Ledger/Eagleton Poll, July 1990 (Poll #: EP 79-4). Conducted by the Eagleton Institute, Rutgers University.

statistically significant variables—even when they are controlled for income, perceived loss or gain of state aid, ideology, and the perceived effect on property taxes, among other factors. The result is that a white parent of a child enrolled in public schools is 31 points less likely to approve of the QEA than a non-white, when all other independent values are held constant at their means. Ideology also has a significant influence on parental attitudes toward the QEA, but it is less pronounced than either race or geographic location of the city. As one moves from liberal, to moderate, to conservative (from 1 to 3), the likelihood of supporting the QEA drops 19 percentage points. Thus, although ideology meaningfully influences parental attitudes toward the QEA, race is clearly a more influential factor. And, surprisingly, economic self-interest plays virtually no role at all. Among parents of school age children, economic concerns do not divide them, but ideology and geography do.

It is of interest to note that the municipality of respondent runs *counter* to the hypothesized trend: The probability difference between a respondent who lives in the inner city and one who lives in the suburbs is 23 percentage points (again, all other values held constant at their means.) But the direction is *positive*. That is, from this analysis one could conclude that

suburbanites are more in favor of the program than inner city residents. But we need to examine these patterns more carefully to fully understand the relationship. Table 5 is a crosstabulation of the approval and disapproval rates across municipality types for white parents of children enrolled in public schools. Table 5 also shows the same for non-white parents.

Whites are almost uniformly opposed to the QEA—at weighted rates ranging from 94.8 percent opposed in the inner city to about 71 percent opposed in new suburbs. Non-whites, in contrast, show a more varied response. Non-whites in the inner city favor the QEA by weighted rates of about 65 percent to 35 percent. Non-whites in the older suburbs, in contrast, *oppose* the QEA by rates similar to whites, 78 percent to 22 percent. But non-whites in the newer suburbs favor the law at rates of about 68 percent to 32 percent. The consistency of white opposition and the variability of black support across municipality types renders the relationship between municipality type and support for the QEA non-linear. This non-linearity produces misleading results because logistic regression assumes linear relationships. Thus, if we were to interpret the logistic regression equation alone, we would come to a somewhat erroneous conclusion that living in the newer suburbs would lead to greater support for the QEA. Perhaps a better way to explain the relationship is to say that whites in the newer suburbs are less opposed than whites in the inner city.

Table 5 is a crosstabulation of the approval and disapproval rates across municipality types for white parents of children enrolled in public schools.

Two elements of this analysis merit further discussion: 1) *intense* white parents' opposition to the QEA in the inner city; and 2) non-white parents' opposition in the older suburbs. Whites whose children attend public schools and who live in the inner city oppose the QEA by a ratio of about nine to one. This finding is remarkable because the QEA was designed to improve inner city education. At least three possible explanations exist for this counter-intuitive finding. First, whites may feel disenfranchised in cities with large minority populations and feel that additional funds will aid minority children rather than white children. Second, whites may feel that the money would be wasted in the inner city schools, despite the fact that their children would receive at least *some* benefit. Third, whites in the inner city may simply be racists, opposing a program that will benefit them because it will also benefit minorities. Whatever the explanation, the pronounced racial division within a group most likely to directly benefit from the QEA—inner-city parents of children enrolled in public schools—combined with the economic irrationality of white inner-city opposition leads me to conclude that race was an implicit factor in opposing the QEA for some important segments of New Jersey's population.

A second finding requires further explanation: the opposition of non-whites in older suburbs, among parents of children enrolled in public schools. Here, whites and non-whites express similar opposition to the QEA. But non-whites in both newer suburbs and in central cities largely endorse the plan. Why do non-whites in older suburbs view the matter differently? One possible explanation may be that non-whites moved to these older suburbs—most likely *from* the central cities—because the educational opportunities were greater for their children there. They may feel, as a result, that the inner city schools are not *worth* the money, having had a direct experience with them.

Whatever the emphasis we place on the matter, this finding indicates that racial cleavages are not uniform—simply bifurcating suburb from inner city, rich from poor. Rather, race works multivalently in New Jersey educational politics, at times salient, at times not.

Table 5.—Quality Education Act approval rates among parents of children enrolled in public schools, by race and municipality type, 1990

Race and attitude	Center city	City and old suburb	New suburb	Rural	Overall
White parents					
Percent approve	5.2	28.2	29.2	25.3	26.6
(N)	(1)	(7)	(22)	(5)	(35)
Percent disapprove	94.8	71.8	70.8	74.7	73.4
(N)	(9)	(18)	(53)	(15)	(95)
Totals	100.0	100.0	100.0	100.0	100.0
(N)	(10)	(25)	(75)	(20)	(130)
Non-white parents					
Percent approve	64.5	22.3	68.4	50.0	52.2
(N)	(13)	(4)	(11)	(1)	(29)
Percent disapprove	35.5	77.7	31.6	50.0	47.8
(N)	(7)	(13)	(5)	(1)	(26)
Totals	100.0	100.0	100.0	100.0	100.0
(N)	(20)	(17)	(16)	(2)	(55)

NOTE: Percentages are weighted slightly to adjust for sampling error.
SOURCE: Star Ledger/Eagleton Poll, July 1990 (Poll#: EP 79-4). Conducted by the Eagleton Institute, Rutgers University. Municipal classifications assigned by the Eagleton Institute.

This quantitative analysis of public opinion towards the Quality Education Act of 1990 is illuminating for a number of reasons. First, we can say that for the population at large, race has little to do with support for the QEA. Instead, pocketbook considerations of how the program will affect individual taxes and how it will affect the aid to one's local district largely determine attitudes of the population at large. In contrast, the attitudes of parents of children enrolled in public schools towards the QEA are less influenced by economic self-interest concerns, but more influenced by their race. Indeed, race is the strongest determinant of their parents support for or opposition to the QEA. But that racial cleavage is somewhat fluid—intersecting with geography and class in ways that sometimes align minorities and whites but usually divide them.

Texas Public Opinion, School Finance, and Proposition One

In Texas, the concerns of race and class are remarkably similar. After the Texas Supreme Court ruled the existing financing system unconstitutional in

1989, the legislature adopted a modest reform. This program, too, was struck down by the Supreme Court. The legislature then passed a constitutional amendment that would allow the state to recapture local property taxes. This reform required, however, majority approval at the polls. Most observers thought securing a victory for the amendment (dubbed by opponents the "Robin Hood" plan) would be a difficult, but not impossible task. A poll conducted by the University of Houston Center for Public Policy a month before the May 1, 1993 referendum showed that 37 percent of survey respondents opposed Proposition One, 29 percent supported it, and a whopping 34 percent were undecided.[16] Another poll, conducted by Mason-Dixon Political-Media Research, Inc. for the *El Paso Times* showed that 53 percent favored the amendment and only 27 percent were unopposed. The remaining 20 percent were undecided.[17]

The polls, however, were wrong. Proposition One suffered a huge defeat, losing 63 percent to 27 percent. Proposition One detractors contended before the election that the opposition was largely concerned with increasing taxes and a failing educational system. Indeed, Tom Pauken, leader of the major opposition group Texans Against Robin Hood Taxes, explicitly played on taxation fears: Proposition One "is a back-door tax increase, it has nothing to do with education," Pauken told a Houston Chronicle reporter. As Pauken stated before the election, "If we make this a tax issue, then we win. If Ann Richards is able to make it an education issue, she wins."[18]

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Answering the question of what determined the outcome of the Proposition One election is essential if we are to understand how courts can be effective in the realm of school finance reform. As we try to locate the sources of popular opposition to court-ordered school finance reform, it would be useful to examine the reasons why large numbers of Texans voted against Proposition One. Ideally, we would examine statewide exit polls to determine explicit or implicit reasons voters had for casting their ballots. Unfortunately, no such exit polls exist. As a result, we have no state-wide individual level voter surveys that would enable us to precisely identify the sources of opposition to Proposition One on May 1, 1993.[19]

What we do have, however, are demographic data and election returns from 150 state representative districts. In this section, I analyze these data to determine some of the demographic characteristics of districts that opposed Proposition One. To be sure, uncovering the demographic characteristics of those regions that voted no on Proposition One is not the same as determining the *reasons* why people who live in those regions voted no. But in the absence of statewide individual level exit polls, I have no recourse but to rely on demographic data to uncover patterns in the opposition to the school finance equalization referendum. To the extent that such patterns exist, they will serve, for my purposes, as explanations of opposition.

[16] See Rugeley (1993). The poll surveyed 790 individuals and had a margin of error of plus or minus four points.

[17] See Associated Press (1993). The Mason-Dixon poll surveyed 819 likely voters and had a margin of error of plus or minus 3.5 points.

[18] See Rugeley and Markley (1993).

[19] Professor Kent Tedin of the University of Houston has conducted surveys of Houston-area residents to determine their support for school finance equalization. Although I cannot fully compare our analyses here, I should note that we reach similar conclusions through different routes.

1. Operationalizing the Models in Texas

Demographic data on each of Texas's 150 House of Representative districts was obtained from the Texas Legislative Council, which is responsible for providing the state legislature with appropriate information for reapportionment. These breakdowns were, in turn, based on the United States Census Bureau data gathered in the 1990 census. Election returns for each of the precincts in Texas from the May 1, 1993 constitutional amendment referendum and the June 1, 1993 U.S. Senate run-off election between Kay Bailey Hutchison and Robert Kreuger were also obtained from the Texas Legislative Council and were aggregated into 150 district totals. Ideally, we would want to regress the election returns from each precinct in Texas against the demographic data for that precinct. This fine-grained analysis would come closer to an individual level survey, and would provide several thousand more data points. Unfortunately, demographic data is not available from the Texas Legislative Council at the precinct level. As a result, the election returns were aggregated to state representative districts.

The models used in the Texas analysis are similar to those used in New Jersey. Like the New Jersey respondents to the Eagleton Institute's poll, Texas voters may have been influenced by arguments of economic self-interest—perceptions that they would have to pay for greater school equity. Demographic data, alone, however, cannot tell us whether individuals perceive a tax increase as imminent in the wake of the reform. (In New Jersey, this data was included in the polling results.) Instead, we must rely on measures of class—on the theory that higher incomes would be more likely to pay for equalization—and on measures of exposure to property taxes, i.e., rates of home ownership. These two variables—per capita income of the state representative district and percent of housing units that are owner-occupied—constitute the economic self-interest model of opposition to Proposition One. The theory here is that those most likely to pay for the costs of equalization—homeowners and those in higher income brackets—would be opposed. Thus, we would expect districts with high percentages of owner-occupied housing units and with high income levels to vote more heavily against Proposition One.

...two variables—per capita income of the state representative district and percent of housing units that are owner-occupied—constitute the economic self-interest model of opposition to Proposition One.

The second model is ideology and/or party identification. Here, we would expect liberals and Democrats to more heavily favor school finance equalization. In the Texas voting data, however, we do not have a measure of ideology for each district. There are, however, two sources for the party identification variable: 1) the percentage of votes won by Republican Kay Bailey Hutchison over Democrat Robert Krueger in the run-off election a month after the Proposition One election or 2) the party of the district representative to the Texas State Assembly. Both are used in the analysis below.

The third model is one based on racial politics. Here, blacks and Hispanics see themselves (or conversely, whites see racial or ethnic minorities) as the primary beneficiaries of school finance reform and, thus, are more likely to vote in favor of it. (Conversely, whites would be more likely to vote against it.) Thus, we would expect districts with high percentages of blacks and/or Hispanics to vote more in favor of Proposition One. Because Hispanics can be of any race, I have subtracted from the total number of blacks in each district those Hispanics who identified themselves as blacks. The result produces, in effect, the number of non-Hispanic blacks within a district.

One further note: A variable to control for an urban-rural split (percentage of district residents that reside in an urban area) is included here because of the geographic isolation of blacks in urban areas. Hispanics in Texas live in both rural and urban areas.

2. **Texas Findings**

The data was analyzed using SPSS for Windows and an ordinary least squares regression technique. Because reapportionment requires districts to be roughly equal in size, the districts were not weighted for population. The results of the OLS are presented in table 6.

From table 6 we see that Per Capita Income, Percentage of Non-Hispanic Blacks, and Percentage of Hispanics all have a significant and fairly sizeable relationship to the percentage of no votes on Proposition One, with higher incomes related to a higher percentage of no votes and higher percentages of blacks and Hispanics related to lower percentages of no votes. Of these three, the two racial categories show the strongest contributions to the percentage of no votes in a district. Surprisingly, the party of the district representative (a rough measure of the party leanings of the district) is not a significant predictor of no votes, if we rely on the conventional 0.05 threshold. Also, the percentage of home ownership in a district and the percentage of urban residents in the district do not show a statistically significant relationship to the dependent variable. Overall, the model shows a healthy 0.63 adjusted R, demonstrating a reasonably good fit.

...Per Capita Income, Percentage of Non-Hispanic Blacks, and Percentage of Hispanics all have a significant and fairly sizeable relationship to the percentage of no votes on Proposition One...

There are some shortcomings to this analysis. First, the measure of party identification does not capture the difference between those districts where the parties are competitive and those where party identification is more one-sided. In an effort to employ a more nuanced sense of party strength, I also ran the regression omitting the dummy party variable and replacing it with the percentage of votes received by U.S. Senate Candidate Republican Kay Bailey Hutchison in the special run-off election against Democrat Robert Krueger, held a month after the Proposition One election. A continuous variable, this measure enables me to capture the degree of party strength in a way that is impossible with the dichotomous state representative party identification. Of course, factors other than party strength—such as candidate-specific factors, the economy, etc.—may play a significant role in the level of support that Hutchinson received. In this respect, this measure may overstate Republican support within traditionally Democratic Texas. The results of this second regression are shown in table 7.

Three significant changes emerge from this change in the party identification variable. First, degree of support for Kay Bailey Hutchison is a much stronger predictor of opposition to Proposition One than the party identification of the state district representative. Part of this is due, no doubt, to the fact that support for Hutchison is registered continuously, and thus more reliably tracks opposition to Proposition One than the dichotomous Republican/Democrat distinction of the first party identification variable. Nonetheless, it is clear that support for Hutchison is a better predictor of opposition to school finance equalization than the party affiliation of the district representative. (For one thing, the R of the entire regression equation improves substantially when we replace the state representative's party with Hutchison's vote percentage.) That fact begs the question, however, of why Hutchison supporters oppose school finance equalization. To answer this, it may be more instructive to view the percentage of votes Hutchison received less as a strength of party identification and more as an indicator of the ideologi-

Table 6.—Municipal regression of percent of no votes on *Proposition One* in 150 Texas house districts, with dichotomous party variable

Independent variables	B	S.E. B	Beta	T-score
Per capita income*	6.033^{-6}	2.433^{-6}	0.202	2.479
Party representative	-0.039	0.023	-0.124	-1.700
Percent of non-Hispanic blacks*	-0.302	0.077	-0.286	-3.912
Percent of Hispanics*	-0.360	0.054	-0.590	-6.726
Percent of housing owner-occ.	-0.002	0.086	-0.001	-0.020
Percent of urban residents	-0.029	0.054	-0.044	-0.542
Constant	0.699	0.094		7.547

* $p<0.05$.

NOTE: Multiple R = 0.805, R^2 = 0.648, Adjusted R^2 = 0.633, and standard error = 0.093. Numbers are multiplied by 10 to the negative X, i.e., $6.033^{-6} = 6.033 \times 10^{-6} = 000006.033$.

SOURCE: Texas Legislative Council. 1994.

Table 7.—Municipal regression of percent of no votes on *Proposition One* in 150 Texas house districts, with continuous party variable

Independent variables	B	S.E. B	Beta	T-score
Per capita income	2.032^{-6}	2.031^{-6}	0.068	1.000
Percent of vote for Hutchison*	0.725	0.085	0.692	8.572
Percent of non-Hispanic blacks	0.059	0.075	0.056	0.790
Percent of Hispanics*	-0.167	0.049	-0.273	-3.424
Percent of housing owner-occ.	-0.139	0.072	-0.109	-1.924
Percent of urban residents	-0.009	0.041	-0.013	-0.210
Constant	0.235	0.085		2.766

* $p<0.05$.

NOTE: Multiple R = 0.873, R^2 = 0.763, Adjusted R^2 = 0.753, and standard error = 0.076. Numbers are multiplied by 10 to the negative X, i.e., $2.032^{-6} = 2.032 \times 10^{-6} = 000002.032$.

SOURCE: Texas Legislative Counsel. 1994.

cal leanings of the district. In this light, the meaning of Hutchison's candidacy is that it registers a cluster of conservative ideological values. And from the regression it is clear that those values—whatever their constituent components—have a very high degree of salience to the school finance equalization debate.

Second, class, as measured by per capita income, no longer has a significant relationship to the question of school finance equalization, when we consider the degree of support within the district for Hutchison. Although there is some degree of collinearity between income and support for Hutchison (the simple r between the two is 0.591), it is clear that ideological/party support for Hutchison is more important than income in determining opposition to Proposition One. It is not the affluent, per se, who are opposed, but conservatives/Republicans who vote for Hutchison who are opposed to Proposition One.

A third significant change produced by the shift from the state representatives party affiliation to the percentage of votes won by Hutchison is a change in the relative important of race and ethnicity. The percentage of non-Hispanic blacks within a district is no longer a sizeable or significant predictor of opposition or support of Proposition One. In addition, the percentage of Hispanics within the district slips from being the largest to the second largest factor in predicting support for Proposition One. It is unclear why the importance of the percentage of non-Hispanic blacks would diminish so dramatically with the substitution of Hutchison's vote percentage for the party affiliation of the state representative. Perhaps the best explanation for the reduced salience of race is that the Hutchison vote percentage is such a good predictor of opposition to Proposition One that there is little variance "left over" for the remaining variables to absorb. Nevertheless, the percentage of Hispanic residents within a district is still a very strong and reliable predictor of support for Proposition One. Thus, even though the class and party variables are more fickle, the ethnic cleavage of Hispanics versus non-Hispanics is an enduring one. With both regressions, racial or ethnic variables are always better and more significant predictors of opposition or support of Proposition One than is income.

...analysis shows that racial and sometimes class or ideological cleavages divide the supporters and detractors of school finance equalization.

3. Implications of Texas Findings

In short, this analysis shows that racial and sometimes class or ideological cleavages divide the supporters and detractors of school finance equalization. The class and ideological divisions are to be expected, but it somewhat surprising to find such *strong* racial divisions within the electorate over this issue. Within the political and legislative debate over school finance, race or ethnicity was not directly broached as the underlying conflict; from a reading of the newspapers, one could not discern a racial conflict. Instead, the issue was usually debated in terms of burdensome taxes on the middle class, or a wasteful, inefficient educational establishment. While those issues may be have been salient and persuasive to a number of individuals, in the aggregate, blacks and Hispanics in Texas view this issue much differently than whites—even taking into account their respective economic and ideological positions. In significant ways, school finance equalization in Texas is not about taxes and economic issues, but about racial cleavages over educational opportunities.

Conclusion: What Can Courts Do About School Finance?

State supreme courts can have substantive effects on the equity of school finance. Figures 1-4 illustrate this. Their efforts to do so, however, will

engender equally substantive mass political opposition—some of which will be racially based. This public opposition is in many ways a constant to school finance reform. As a result, the success or failure of courts' efforts to improve the equity of school funding in primary and secondary education depends ultimately on the capacity of the legislature to withstand this heated political opposition. Courts can act decisively in the face of legislative recalcitrance, by threatening to use injunctions to enforce compliance with the courts decrees—and court's have relied on this threat to ensure passage of politically unpalatable school finance reforms.[20]

But other than the negative sanction of a threatened school shutdown, there is little a court can do to compel a legislature to act. Instead, it must rely on the legislature's capacity to forge political coalitions to enact reform legislation. These coalitions of interest groups and key legislators are highly susceptible to public opinion. Thus, a full account of court's capacity to alter significantly the equity of school financing would link public opinion on school finance with interest group pressure on legislators, who must also confront supreme court justices with injunctions on their minds. Although it is beyond the scope of this paper to provide such links, further examinations into the relative strengths and weaknesses of state supreme courts to accomplish their school finance reform goals must engage this interplay of mass public opinion and interest group coalition building. Courts can achieve impressive results, and they can do so by altering the political calculus legislators and interests groups must make as they decide to support meaningful equalization or oppose it.

[20] The New Jersey Supreme Court allowed an injunction to lie against the disbursement of state funds for education in July, 1976. The entire school system shut down. Within nine days, the legislature passed an income tax in order to remove the injunction. See Lehne (1978) for details. Since then, no legislature has endured an injunction although other state courts have come perilously close, particularly Texas and Connecticut.

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Principles and Practices in Resource Allocation to Schools under Conditions of Radical Decentralization

Brian J. Caldwell
University of Melbourne
Victoria, Australia

About the Author

Dr. Brian J. Caldwell is a Professor of Education and Head, Department of Education Policy and Management at the Unversity of Melbourne. He was appointed to a Personal Chair in 1993, the first such appointment in education at the University of Melbourne, which is Australia's leading research university. This appointment was largely in recognition of his scholarly work over two decades in the field of school-based management.

Dr. Caldwell served as Chair of the Education Committee on the School Global Budget in Victoria, making recommendations to the Minister for Education on how resources should be allocated to schools in this Australian state where 90 percent of the education budget is decentralized for local decision-making in the public system of 1,700 schools. He is co-author with Jim Spinks of two books that have influenced policy and practice in school-based management in several nations, *The Self-Managing School* (1988) and *Leading the Self-Managing School* (1992). *Beyond the Self-Managing Schools* will be published in 1998. With Don Hayward, he proposes a new framework for the resourcing of public and private schools in *The Future of Schools: Lessons from the Reform of Public Education* (1997).

Dr. Caldwell obtained his Ph.D. at the University of Alberta, Canada with a dissertation on pioneering practice in school-based budgeting in the Edmonton Public School District in the mid-1970s. He is Fellow of the Australian College of Education and the Australian Council for Educational Administration.

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Victoria, Australia

Introduction

Interest in site-based management has waxed and waned over the last three decades. Few school districts in the United States have proceeded to full implementation where most of the district's budget is decentralized to the site level for school decision-making. Where this has occurred or is contemplated, an issue facing the school board is to determine formulae to allocate resources to schools and to build a framework for accountability in the deployment of those resources. There is now substantial experience in several nations in addressing this issue. Apart from the pioneering case of the Edmonton Public School District in Alberta, Canada, there is nation-wide experience in New Zealand, the United Kingdom, and in the state of Victoria in Australia, which is now the largest system of public schools anywhere to have decentralized as much as 90 percent of its school education budget.

The significance of this development in Australia cannot be stressed too highly in the context of developments elsewhere, including the USA: a public school system of 1,700 schools covering a diversity of settings, urban and rural, has decentralized 90 percent of its total school education budget, including staff. It is radical decentralization when viewed in this context.

The purpose of this paper is to outline principles and practices in resource allocation to schools under these conditions of radical decentralization, paying particular attention to what is unfolding in Victoria, where a comprehensive and coherent program of reform has been under way since late 1993. This paper lays the foundation for a detailed exposition of the funding mechanism and its data requirements provided by Peter Hill in another paper (Hill 1996).

Principles

The reform of schools in the public sector is proceeding apace in Australia and in comparable nations. The broad features are essentially the same, illustrated in figure 1 for the *Schools of the Future* program in Victoria: the creation of a system of self-managing schools within a curriculum and standards framework ('Curriculum' in figure 1). Consistent with efforts to restructure the public sector, there has been downsizing of central and regional agencies, with a small but powerful strategic core 'steering' the system. While personnel for the most part remain centrally employed, there is increasingly a capacity at the school level to select staff and determine the mix of professional, para-professional, and support arrangements ('People' in figure 1). Schools have their own budgets, in a process variously described as global budgeting or school-based budgeting, allowing discretion in deployment at the local level according to a mix of school and state priorities ('Resources' in figure 1), which in Victoria is embodied in a school charter that provides a framework for planning and accountability over a three-year period ('Accountability' in figure 1).

These features are most evident in Victoria, where reform since the election of the first Kennett Government in late 1992 is arguably the most sweeping in any system of state school education in Australia since the establishment of government schools in the late nineteenth century. More than 90 percent of recurrent expenditure is distributed to schools in a school global budget. In these and most other respects, the reforms in Victoria are most like what has occurred in Britain and, to a lesser extent, New Zealand. An exception, at least for the present, is associated with the distinction between self-managing and self-governing schools, with some schools in Britain taking advantage of the 'opt out' provision of the 1988 Education Reform Act, leaving their local education authorities to become 'grant-maintained schools.' However, with about 1,700 schools, Victoria has the distinction of being the largest system of public education anywhere in the world to have adopted the new arrangements and to have decentralized such a large part of the state budget for school education.

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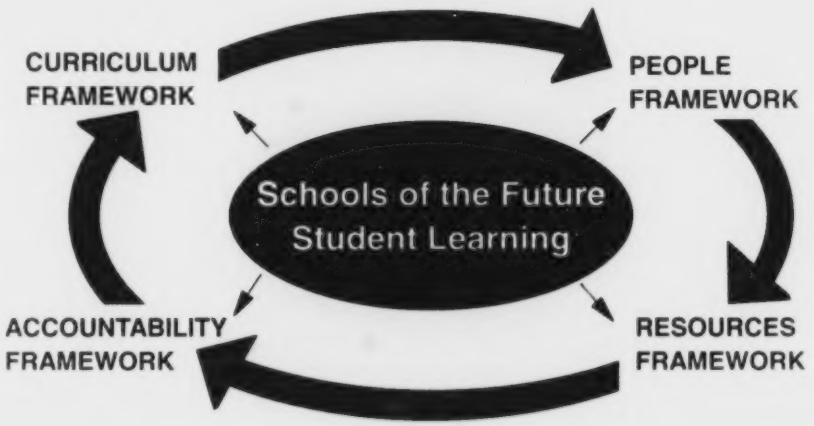
The forces shaping these developments are varied, as are the ideologies and rhetoric that have shaped public discourse. In a recent review, Caldwell (1994) examined developments in six nations (Australia, Canada, Hong Kong, New Zealand, United States, and the United Kingdom) and identified five themes: (1) efficiency and effectiveness in the delivery of public services, (2) ideology that embraces a faith in the market mechanism as a means of securing improved outcomes in the delivery of education, (3) equity in the allocation of scarce resources, (4) empowerment of the school community, and (5) research on school effectiveness and school improvement.

Analyzing Reform in a Framework of Values

Swanson and King (1991) provide a framework of values for the analysis of reform in school education:

Five values or objects of policy that have been historically prominent in shaping Western societies and are also particularly relevant to making decisions about the provision and consumption of educational services are liberty, equality, fraternity, efficiency, and economic growth. Each has experienced ascendance and descendance in priority with changing societal circumstances, but none has ever lost its relevance entirely. The current shift in priorities placed on these five values

Figure 1.—Framework for reform in *Schools of the Future* in Victoria, Australia



SOURCE: Victoria, Department of Education.

> underlies much of the controversy surrounding education today. (Swanson and King 1991, 22-23)

In Australia, education is constitutionally a state responsibility, traditionally provided through relatively centralized arrangements wherein an education department has made most of the important decisions affecting the allocation of resources. Staff were allocated to schools according to a simple formula based on size and level of schooling; supplies and equipment were allocated or requisitioned along similar lines. The value of equality meant allocating uniformly. The value of liberty meant little, for children had to attend the school nearest their home. An early challenge to these values was offered in a widely-read critique of Freeman Butts, visiting Australia from Columbia University, New York, in his critique of assumptions underlying education (Butts 1955). He challenged the ascendance of equality as uniformity and the absence of liberty (choice) and fraternity (government control at the expense of community empowerment).

A shift in the balance of these values occurred in the 1970s, signalled in Australia in the report of the Interim Committee of the Australian Schools Commission (Karmel 1973):

> The Commission favors less rather than more centralized control over the operation of schools. Responsibility should be devolved as far as possible upon the people involved in the actual task of schooling, in consultation with the parents of the pupils whom they teach and, at senior levels, with the students themselves. (Karmel 1973, 10)

Twenty years later, a successor body, the Schools Council of the National Board of Employment Education and Training, enunciated the same values, making them more explicit in respect to the self-managing school and the allocation of resources, in this instance concerning schooling for young adolescents:

> School communities should be able to demonstrate sufficient flexibility to respond positively and swiftly to changing needs and circumstances. If the goal of the self-managing school is to be realized, then schools should have the capacity to modify their resourcing arrangements to increase learning opportunities for all young adolescents. (Schools Council 1993, 100)

An outcome of the Australian Schools Commission was a series of special purpose grants to states, many to be dispersed to schools on the basis of submissions prepared by staff and members of the community. The number of such grants increased rapidly, supplemented by others at the initiative of state governments. The value of equality as uniformity in resource allocation shifted to equity or fairness in relation to resourcing according to special educational needs. The dezoning of school attendance that occurred in most states in subsequent years, and the empowerment of the community through structures such as school councils, raised the profile of liberty (choice).

Coherence in a movement toward the concept of a school global budget gathered momentum in Victoria in the early 1980s with the introduction of program budgeting, elevating a concern for efficiency, and the further empowerment of school councils to set policy and approve budgets, which amounted to about 5 percent of recurrent expenditure. These developments were stalled in the late 1980s by the opposition of teacher unions and parent organizations but were moved forward in dramatic fashion by the Kennett government in the early 1990s, by which time a dominant value was efficiency, given the financial plight of Victoria, with a nationwide concern for economic growth a contributing factor to the building of curriculum and standards frameworks.

This shift in the balance of values in the 1970s was also evident in the United States when early approaches to self-management or school-based management made their appearance. Influential writers on school finance built a case on deficiencies of centralized allocation of resources to schools which were perceived to assume sustained growth, to increase educational inequalities, contribute to inefficiencies and stifle citizen participation and parental choice of school. (Garms, Guthrie, and Pierce 1978). Adoption in the United States in the intervening years has been fragmented at best, with complexity in governance arrangements and regulatory requirements being significant contraints in a nation of 50 states and 15,000 public school districts. The mid-1970s reform in school-based budgeting in the Edmonton Public School District in Alberta, Canada, pioneered by long-serving superintendent Michael Strembitsky, remains the exemplar in North America.

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Such fragmentation has not been evident in Britain where the governments of Margaret Thatcher and John Major have assembled the framework described at the beginning of this paper, now implemented in England and Wales in more than 25,000 schools in over 100 local education authorities. There now appears to be a settlement along political lines on the major feature of the framework with parties vying in their promises of what proportion of a local education authority's school budget ought to be decentralized to schools. The current minimum of 85 percent is likely to rise to 90 percent, comparable to Victoria, or even to 95 percent in the change of government anticipated in the months ahead.[1] A leading British scholar on the

[1] A Labor Government was elected on May 1, 1997 with a manifesto that assures the future of this approach to resource allocation.

economics and finance of school education, Rosalind Levacic, concludes that the values driving self-management, or local management as it is known in that country, are efficiency, effectiveness and choice (Levacic 1995, 19). She adds equity in setting criteria to judge the outcomes, nominating procedural equity ('consistent application of agreed rules') and distributive equity ('distribution of income and wealth and the means to obtaining these'), with the latter comprising horizontal equity ('every individual in like circumstances should receive the same treatment') and vertical equity ('individuals who have different needs should be treated in ways which compensate for these differences') (Levacic 1995, 30-32). According to Levacic, the bases for allocating resources to schools in a system of self-managing schools ought to reflect these criteria.

Principles Underpinning the School Global Budget in Victoria

Having determined that approximately 90 percent of the state's budget for schools would be allocated to schools through a mechanism known as the School Global Budget, the Kennett Government had to establish a basis for allocation. To assist in this task, a committee was set up to advise the Minister for Education. The recommendations in two reports (Education Committee 1994; Education Committee 1995) were accepted and implemented, with per-capita core funding supplemented by needs-based allocations for students at educational risk, students with disabilities and impairments, rurality and isolation, students with non-English-speaking backgrounds, and priority programs. Of particular interest are the principles that the committee adopted from the outset:

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Pre-eminence of educational considerations

Determining what factors ought to be included in the construction of the School Global Budget and what ought to be their relative weighting are pre-eminently educational considerations.

Fairness

Schools with the same mix of learning needs should receive the same total of resources in the School Global Budget.

Transparency

The basis for allocations in the School Global Budget should be clear and readily understandable by all with an interest. The basis for the allocation of resources to each and every school should be made public.

Subsidiarity

Decisions on resource allocation should only be made centrally if they cannot be made locally. Decisions on items of expenditure should only be excluded from the School Global Budget if schools do not control expenditure, if there is excessive variation of expenditure, if expenditure patterns are unpredictable, if expenditure is once-off, or for expenditure for which schools are payment conduits.

Accountability

A school which receives resources because it has students with a certain mix of learning needs has the responsibility of providing programs to meet those needs, has the authority to make decisions on how those resources will be allocated, and should be accountable for the use of those resources, including outcomes in relation to learning needs.

Strategic implementation

When new funding arrangements are indicated, they should be implemented progressively over several years to eliminate dramatic changes in the funding levels of schools from one year to another.

(Education Committee 1994, 1995)

The committee found that the size of the current differential in allocations to elementary and secondary schools in favor of the latter was not warranted if the first principle ('pre-eminence of educational considerations') was taken into account. Accordingly, it recommended that allocations reflect needs at different stages of schooling (P–4, 5–8, and 9–12) and continues its work that will lead to the submission of a final report in December 1996. In doing so, it is paying particular attention to research on school and classroom effectiveness, especially in the early elementary years for outcomes in literacy, and in the middle years, for issues associated with student alienation. It is likely that changes will be recommended in relativities for allocations at different levels of schooling. Having expressed a view that there is no justification for reducing levels of funding at the secondary level, it is evident that the principle of strategic implementation will be invoked and that efficiency will be a paramount consideration. This further work suggests that the principles of effectiveness and efficiency, implied in its work thus far, ought now to be made explicit, perhaps along the following lines:

...the elements of the framework that are shaping developments in Victoria are efficiency (and effectiveness), equity (both procedural and distributive), and liberty (choice).

Effectiveness

Relativities among allocations in the School Global Budget should reflect knowledge about school and classroom effectiveness.

Efficiency

Allocations in the School Global Budget should reflect knowledge about the most cost effective ways of achieving desired outcomes in schooling.

Adopting this view of efficiency acknowledges that efficiency is also affected by the state of knowledge on effectiveness and the rate of take up of this knowledge in schools. Hywel Thomas (1996), like Levacic, a leading British scholar on the economics and finance of education, contends that efficiency will be constrained by knowledge and the capacity to apply knowledge of what will yield a higher output and, for this and other reasons, suggests there are limits to efficiency in schools:

> That this should be so turns primarily on the absence of a convincing or wholly adequate theory of learning—a prerequisite for specifying clear technical relationships as a predictive basis for the relationship between inputs and educational outcomes... There is the added difficulty that schools are multi-purpose organizations and the achievement of some goals are not always compatible with others. (Thomas 1996, 34-35)

He proposes that schools should seek to become more cost effective, an efficiency-related concept, engaging in cost-effectiveness analysis that 'compares alternative ways of achieving the same objective: the most cost effective will be the least costly of alternatives being compared, which is not necessarily the cheapest possible method of attaining the objective (Thomas 1996, 35).'

In general, the elements of the framework that are shaping developments in Victoria are efficiency (and effectiveness), equity (both procedural and distributive), and liberty (choice).

Practices

Applying these principles in Victoria is a complex process that has been under way since 1994. That it should be so complex and time-consuming is astonishing, given that the system of public education has been established for well over a century and that relatively sophisticated accounting and management information systems have been around for a decade or more. Particular attention is given here to two particular issues that have proved problematic in different settings. The first is how resources are allocated among elementary and secondary schools, given that perceived inequity has been a contentious matter. The second is how resources are allocated to meet the needs of students at educational risk, students with disabilities and impairments, or students from a non-English speaking background.

The best established practice in an international comparison is to be found in Edmonton, Alberta, Canada which in recent years has settled on a simple eight level approach to allocation of resources to schools, with relativities ranging from 1.00 for students in regular kindergarten, elementary, junior high, and senior high programs, to 6.34 for students who are hearing impaired, visually impaired, autistic, deaf and blind, or physically handicapped at the most severe level (these relativities are for 1993–94; there have been changes in recent years, including a higher relativity for senior high). Noteworthy is the equity in per student allocations for students at different levels of schooling, dating from historic collective agreements in the early 1970s that achieved parity in working conditions for teachers across the system, and simplicity of the approach, with most levels connected to different levels of resources for students with special learning needs.

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As noted at the outset, however, the Edmonton example, while long-standing, stable and successful, does not readily translate to much larger settings and greater diversity in student population. Approaches in Victoria (Australia) and England and Wales (Britain) are briefly summarized.

Australia (Victoria)

There are six elements in the approach to resource allocation in Victoria. Core funding accounts for about 90 percent of allocations to school global budgets, and this covers teaching and non-teaching staff costs, teaching and administrative support, salary-related and premises-related costs. The basis for allocation to schools has been strictly along elementary and secondary lines, the educational rationale for which has been challenged during the work of the Education Committee making recommendations to the Minister for Education. The Education Committee is currently working on a 'stages of schooling' approach, with three stages under consideration: Preparatory (Kindergarten) to Year 4, Years 5-8, and Years 9-12.

Four elements are concerned with special learning needs and are associated with efforts to develop school indices or classifications that take account of differences among students or schools. These four elements are titled special learning needs (students at educational risk), rurality and isolation, students with disabilities and impairments, and students from non-English speaking backgrounds. The most notable development in the last twelve months is in respect to the special learning needs element, with a shift away from a school index of need based on out-of-date census information that classified the school community rather than the characteristics of students, to a six-component index that includes measures of aboriginality, entitlement to special family financial support, family circumstances

(living with neither, one or two parents), language spoken at home, occupation of highest-earning breadwinner, and transience (mobility). The index of need now in place reflects actual student characteristics for those registered in the school in the year for which resources are to be allocated. Details of these developments are provided by Hill (1996).

Allocations for students with disabilities and impairments involve six levels in a classification of need. Students are classified in a school-based process of data collection involving teachers, parents, and specialists. The developmental process has revealed significant historical inequities in resource allocation, and the task now facing the Education Committee is establishing a fair and transparent approach that will be effective and efficient.

The sixth element in the allocation is for priority programs, essentially allocations that apply to particular school such as instrumental music that cannot be readily translated into a formula.

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Britain

While there is no prescribed funding model in Britain, local education authorities must allocate at least 80 percent on the basis of student numbers, with no more than 5 percent for students with special educational needs. The so-called Age-Weighted Pupil Unit has been used almost universally, with most authorities now tying this closely to the Key Stages of Learning in the National Curriculum (infants up to age 7, juniors aged 7 to 11, pre-GCSE aged 11 to 14, preparation for GCSE, and equivalent vocational pathways aged 14 to 16). Disparities in funding between elementary and secondary are as much a concern as in Victoria. Efforts to develop a more educationally defensible approach to resource allocation, generally known as 'activity led funding,' have limitations for a range of reasons, including complexity, prescriptiveness, and input orientation.

The three categories in the Victorian context of students at educational risk, students with disabilities and impairments, and students from a non-English speaking background, may be broadly matched to what are described in England as students with special educational needs (SEN). The chief indicator in England for 'at risk' students has been the number who are entitled to receive a free school meal, which for the most part is an indicator of socio-economic disadvantage. Some authorities incorporate measures of literacy and degrees of fluency in language. There is a clearly discernible effort to develop a more systematic approach to the identification of need, in much the same fashion as that underway in Victoria, with a so-called audit approach increasingly favored. This calls for data on the individual needs of students to be collected at the school level according to levels of need specified in a five-stage *Code of Practice*.

The recently adopted *Code of Practice* is intended to cover the needs of about 20 percent of students in the school population who may be expected to have some special educational need during the course of their schooling. The *Code* specifies five stages for the identification and assessment of special education needs, with the first three carried out at the school level and last two carried out at the authority level. Statements are issued for students with such needs, and these specify what programs and outcomes are expected, with appropriate accountability mechanisms at each point in the process.

Delegated budgets are only now being extended to special schools in England, with all to have global budgets by 1996–97. Special schools are currently funded on the basis of a specified number of 'places'

at a school, weighted for types of need. A feasibility study commissioned by the then Department of Education and Science (Touche Ross 1990) advocated three components in funding formulae for special schools in the future: a 'place' element, a pupil element, and a non-pupil element. This study recommended against categorization of individual students and called for high levels of transparency and flexibility in the use of funds, subject to accountability requirements as subsequently set out in the *Code of Practice*.

Outcomes

The most comprehensive research to date on the impact of these mechanisms has been done in Britain, where up to eight years' experience has been gained. Levacic (1995, 190) found that, of four criteria (effectiveness, efficiency, equity, and choice), 'cost-efficiency is the one for which there is most evidence that local management has achieved the aims set for it by government,' especially through the opportunity it provides for schools to purchase at a lower cost for a given quality or quantity than in the past, and by allowing resource mixes that were not possible or readily attainable under previous more centralized arrangements. She found evidence for effectiveness to be more tenuous, although the presumed link is through efficiency, making resources available to meet needs not able to be addressed previously.

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In Britain, as elsewhere, there has been no research to determine the cause-and-effect relationship between self-management and discretionary use of resources and improved learning outcomes for students, although there is opinion to the effect that gains have been made. Bullock and Thomas (1994, 134-134) reported that an increasing number of principals believe there are benefits from local management for student learning. In responding to the statement that 'Children's learning is benefiting from LM,' the number of agreements among elementary principals increased from 30 percent in 1992 to 44 percent in 1992 to 47 percent in 1993. A similar pattern was evident among principals of secondary schools, increasing from 34 percent in 1991 to 46 percent in 1992 to 50 percent in 1993. Among both elementary and secondary principals, those in larger schools were more positive than those in smaller schools. For example, in 1993, among elementary principals, 41 percent of those in smaller schools agreed compared with 50 percent in larger schools; among secondary principals; 30 percent of those in smaller schools agreed compared to 80 percent of those in larger schools.

On other outcomes, while her research did not explicitly address these elements, Levacic cited the case study research of Ball (1993) and Bowe et al. (1994a, 1994b) in respect to distributive equity and choice:

> ... the indications are that socially disadvantaged parents are less able to avoid ineffective schools for their children. There is also ad hoc evidence that schools in socially deprived areas have suffered a loss of pupils to other schools... (Levacic 1995, 195)

Such effects raise the stakes in ensuring that all schools develop a capacity for school improvement, drawing on much sturdier 'theories of learning' derived from research on school and classroom effectiveness than have existed in the past. Also indicated is an approach to marketing that ensures all parents have information about schools that their children may attend.

The most sustained positive view in North America is presented in surveys of opinion in the Edmonton Public School District in Alberta, Canada, a city system of about 200 schools with 15 years

experience. In the early stages, the focus of school-based management in Edmonton was the budget; hence its early designation as an initiative in school-based budgeting. All principals, teachers, students, system personnel and a representative sample of parents are surveyed annually. Brown's independent analysis of the evidence led him to observe that:

> The Edmonton surveys reveal an increase in the form of satisfactions registered by large numbers of parents, students, and personnel working in schools and district office. These results appear stable, significant, and superior to those observed in general surveys conducted in the rest of Canada and United States. (Brown 1990, 247)

In Victoria, the Victorian Primary [Elementary] Principals Association, the Victorian Association of State Secondary Principals, the Department of Education, and the University of Melbourne have formed a consortium to monitor processes and outcomes over a five-year period to 1997. To date there have been 6 state-wide surveys of principals and 15 focused investigations by post-graduate research candidates at the University of Melbourne (Cooperative Research Project 1994, 1995a, 1995b, 1996, 1997). Benefits to date as reported by principals lie mainly in the area of planning and resource allocation, suggesting a contribution to cost-efficiency, but confidence that there will be an impact on outcomes for students is relatively high. In the most recent survey (Cooperative Research Project 1997), 85 percent of principals rated the realization of improved learning outcomes for students at 3 or higher on a 5 point scale (from 1 'low' to 5 'high'). A robust explanatory model has been derived from the data to show direct and indirect effects of capacities nurtured by the reforms and perceived curriculum and learning outcomes.

One outcome of the reforms is likely to be increased economic awareness at the school level and, arguably, a contribution to theories of economics as applied to public education.

The Decade Ahead

While there is much further developmental work and research to be undertaken in Victoria and elsewhere, nationally and internationally, it is clear that the broad framework described in this paper will stabilize and shape the management of public education, at least to the end of the decade.

One outcome of the reforms is likely to be increased economic awareness at the school level and, arguably, a contribution to theories of economics as applied to public education. While some academics and senior policy makers were familiar with the concepts, terms like efficiency and economics have traditionally been anathema to those in schools. Indeed, it is astonishing that it is only now, in the late twentieth century, more than one hundred years after the formation of systems of public education, that the basis for allocating resources among schools has become transparent. In each setting, the concepts of efficiency, effectiveness and equity are likely to gain currency with the heightened focus on outcomes that arises from implementation of a curriculum and standards framework and accountability processes. It is likely that discourse on economics and education will start to converge after decades of divergence.

Peter Drucker (1995) offers an insight that suggests that these developments in schools will contribute to theory in the economics of education. Drucker spells out the opportunities and the threats to school education in the 'knowledge society:'

> Paradoxically [in the knowledge society], this may not necessarily mean that the school as we know it will become more important. For in the knowledge society clearly more and more knowledge, and especially advanced knowledge, will be acquired well past the age of formal schooling, and increasingly, perhaps, in and through educational processes that do not center on the traditional school—for example, systematic continuing education offered at the place of employment. But at the same time, there is very little doubt that the performance of schools and the basic values of the schools will increasingly become of concern to society as a whole, rather than be considered 'professional' matters that can safely be left to the 'educator.' (Drucker 1995, 204-205)

He set six priority tasks for society in the 21st century, and three of these involve knowledge and education:

- We will have to think through *education*—its purpose, its value, its content. We will have to learn to define the *quality* of education and the *productivity* of education, to measure both and manage both (p. 236).

- We need systematic work on the *quality of knowledge* and the *productivity of knowledge*—neither even defined so far. On those two, the performance capacity, and perhaps even the survival of any organization in the knowledge society will increasingly come to depend (pp. 236-237).

- We need to develop an *economic theory* appropriate to the primacy of the world economy in which knowledge has become the key economic resource and the dominant—and perhaps even the only—source of comparative advantage (p. 237).

Conclusion

These priority tasks in Drucker's agenda for the twenty-first century place a high premium on the capacity to define, gather, and utilize information for education and schooling in the knowledge society. However, the groundwork has already been laid, and is especially evident in systems of education where there has been radical decentralization, as illustrated in Victoria, Australia, the largest anywhere in the public sector to have decentralized as much as 90 percent of resources in its school education budget, to be deployed at the local level within a comprehensive and coherent framework along the lines illustrated at the outset.

> ***...Victoria, Australia, the largest anywhere in the public sector... decentralized as much as 90 percent of resources in its school education budget, to be deployed at the local level within a comprehensive and coherent framework...***

Site-based management on this scale has forced the creation of resource allocation mechanisms that are defensible according to principles such as efficiency, effectiveness, fairness, transparency, susbsidiarity, and accountability. When applied in allocations to meet special learning needs, data are complex and their collection and utilization a challenge from the outset. The development of a comprehensive computer-based management information system is a prerequisite for success.

At the school level, these same principles ought to apply and, as at the system level, the achievement of efficiency and effectiveness is dependent on the level of knowledge about 'what works'. The increasingly comprehensive knowledge base on school and classroom effectiveness and improvement must now shape practice at all levels. Given typical patterns of knowledge utilization, this provides a substantial agenda for professional development. Given that the

knowledge base is incomplete, each initiative in site-based management should have a research component to guide resource allocation and deployment in the manner illustrated in the development and refinement of the School Global Budget in Victoria (Hill 1996).

Under these circumstances, what is at first sight a technical reform in resource allocation is, in reality, a deeply complex transformation, underpinned by fundamental values, and driven by a rich array of data in every element of the management process at all levels of schooling. It is an exciting and challenging time for those with an interest in educational data.

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Building Equity and Effectiveness into School-Based Funding Models: An Australian Case Study

Peter W. Hill
Center for Applied Educational Research
University of Melbourne
Victoria, Australia

About the Author

Peter Hill is Professor of Education (Leadership and Management) at The University of Melbourne and Deputy Dean of the Faculty of Education. He is also chair of the Board of Directors of the Australian Principals Centre and Director of the Centre for Applied Educational Research at The University of Melbourne.

Professor Hill has worked extensively in state education systems and was formerly Chairperson of the Victorian Curriculum and Assessment Board and Chief General Manager of the Department of School Education in Victoria. The latter position involved overall responsibility for more than 2,000 schools, 52,000 teachers and other staff.

Professor Hill's current interests include research into educational effectiveness and improvement, school funding arrangements, educational assessment and strategic planning in education. He has contributed over a three-year period to the work of the Education Committee established by the Minister for Education in Victoria to advise on policies for the funding of Government schools.

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Peter W. Hill
Center for Applied Educational Research
University of Melbourne
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The Trend Toward School-Based Funding

Traditionally within Australia, as in other English-speaking countries, the financing of government school education has involved central control over all budgeting and financial operations, the use of line-item budgets to identify and account for expenditures, and the use of staffing formulae based on industrial agreements to anchor the major item within education budgets, namely staff salary costs. For many years, all items of recurrent operating expenditure were centrally controlled and administered, and schools were virtually cashless. For example, schools would place requisitions for items such as paper, pencils, chalk, and other requisites and these would be provided on demand from a central store. Over time, schools were given control over budgets for most non-salary operating costs. However, the lions share of the school education budget, namely teaching staff salary costs, continued to be centrally administered, as was the staffing function generally.

While the centralization of budgeting and financial administration spared teachers from a significant involvement in non-teaching tasks, it resulted in many inefficiencies, delays, and inflexibilities. It also meant that there was little incentive at the school level to regard financial resources as a part of the total mix of ingredients to be brought together and managed in order to maximize student learning.

More recently, the trend both within Australia and in other English-speaking countries has been to reduce the involvement of the center in the day-to-day operations of schools, to decentralize educational administration and to devolve responsibility, authority, and accountability directly to the school level (Caldwell 1993; Caldwell and Spinks 1992; Levacic 1995; OECD 1987; Picot 1988). Government schools

have been encouraged or required to accept increased autonomy aimed at improving the quality and responsiveness of local decision-making and hence the quality of the education provided to students. A key feature of this move toward a more devolved system of self-managing schools has been the development and implementation of school-based funding models which place control over an increasing proportion of the total available financial resources at the individual school level.

This trend toward a more devolved approach to the financial resourcing of schools is most evident in Victoria, Australia where a Liberal-National Coalition Government, building on a long history of devolved management of schools, has implemented a package of reforms known as "Schools of the Future." A key element of the Schools of the Future program is the "School Global Budget," which is intended to give schools flexibility to match financial and staff resources to the learning needs of their students. Through the School Global Budget, government schools in Victoria have been given control of about 87 percent of the total recurrent budget for school education.

A key feature of this move toward a more devolved system of self-managing schools has been the development and implementation of school-based funding models...

The School Global Budget was implemented in 1955, drawing in part on recommendations of an Education Committee, which reported to the Minister for Education in 1994 (Education Committee 1994). The Education Committee was reconstituted in 1995 to make further recommendations to the Minister for Education on matters related to the ongoing design and implementation of this funding mechanism, and to oversee a School Global Research Project to furnish data to guide the work of the Committee. The Interim Report of this committee was published in June of that year (Education Committee 1995). A further Interim Report will be published shortly.

This paper reports on the approach taken by the Education Committee in developing a school-based funding model based on a number of desirable characteristics or principles, which are intended to ensure an equitable and effective approach to the funding of schools.

The Australian Context

Before going into details on the school-based funding model under development, it is useful to know something of the context. In terms of the share of total national resources devoted to school education, the Organization for Economic Co-operation and Development (OECD) data indicate that Australia is one of a group of countries with a low proportion of Gross Domestic Product (GDP) to primary and secondary education (see table 1). Other countries with a similar level of expenditure include Japan and Germany.

The main source of funds for primary and secondary schooling in Australia is income tax collected by the Commonwealth (federal) government and subsequently passed on to the State and Territory governments through general and specific purpose grants. In allocating funds to the States/Territories, the Commonwealth government takes into account the actual costs of provision in different states. States and Territories have considerable discretion over the actual amount which they will spend on school education. Table 2 summarizes per capita expenditure on government schools within the eight States/Territories. With the notable exception of the Northern Territory where isolation imposes very high costs of provision and there is a significant proportion of indigenous people living in poverty, it will be seen that there is not a great deal of variation in expenditure between States/Territories.

Table 1.—Education expenditure as a percentage of GDP for primary and secondary education by origin of funds

Country	Direct public expenditure for educational institutions	Total public expenditure, including subsidies to the private sector
Australia	2.9	3.0
Japan	2.8	2.8
United Kingdom	4.0	4.1
United States	3.9	3.9
OECD	3.5	3.5

SOURCE: OECD (1995: 74).

Table 2.—Per capita expenditure on government schools by level of education, states and territories, 1993–94 financial year, U.S. dollars (at $U.S. 0.75 per $A 1.00)

State	Students	Primary	Secondary	Ratio of seconday to primary	Total	Percent variation from mean
NSW	755,771	2,866	4,283	149	3,446	-3.4
Victoria	520,328	3,051	4,391	144	3,614	1.3
Queensland	403,234	2,920	4,097	140	3,334	-6.6
SA	181,640	3,517	5,322	151	4,096	14.8
WA	223,105	3,007	4,570	152	3,557	-0.3
Tasmania	64,061	3,207	4,297	134	3,667	2.8
NT	26,934	4,726	6,645	141	5,246	47.0
ACT	39,865	3,476	4,598	132	3,970	11.3
Australia	2,214,938	3,036	4,407	145	3,568	0.0

NOTE: Details of inclusions and exclusions are given in an end-note to this paper.
SOURCE: MCEETYA (1996: 36).

Table 2 also indicates that per capita secondary school funding is on average 45 percent higher for secondary schools than for primary schools.

A further piece of information that is relevant to understanding the funding of government schooling in Australia is the high proportion of students (in excess of 29 percent) attending non-government schools. The non-government sector includes a substantial systemic Catholic sector. Non-government schools receive per capita funds from the Commonwealth government according to a 12-category table of per capita funding levels ranging from $334(US) to $1,375(US) per primary student and $530(US) to $2,011(US) per secondary student, with schools classified into one of the 12 categories according to need. This represents a relatively high level of support, but is nevertheless substantially below that provided within the government sector.

Finally, Victoria is a state with a population of around six million people and with a government school system serving about 520,000 students in approximately 1,730 schools. It has a land area roughly the size of Wisconsin or Missouri.

Principles Underpinning the School Global Budget in Victoria

The development of the School Global Budget has proceeded on the basis of a set of principles that the Education Committee considers should underpin the funding of government schools.

The development of the School Global Budget has proceeded on the basis of a set of principles that the Education Committee considers should underpin the funding of government schools. They are as follows:

Pre-eminence of educational considerations

Factors included in the construction of the School Global Budget and the relative weighting given to each factor should depend pre-eminently upon educational considerations. This implies the elimination of disparities reflecting historical and political decisions for which there is no current or future educational rationale.

Cost effectiveness

Relativities among allocations in the School Global Budget should reflect knowledge of efficient ways of achieving school and classroom effectiveness. Thomas (1996) has suggested that school systems should seek to become more cost effective and undertake cost effectiveness analyses that compare alternative ways of achieving the same objective. In practice, systems are able to compare only a limited range of alternatives, thus funding models that are based on this principle will incorporate knowledge about the least costly of the alternatives being compared, which may not necessarily imply the cheapest possible method of attaining the objective.

Fairness

Schools with the same mix of learning needs should receive the same total of resources in the School Global Budget. This means obtaining accurate and comprehensive information on those characteristics which best predict or define learning needs of students and using this information in allocating financial resources to schools.

Transparency

The basis for allocations in the School Global Budget should be made public and should be clear and readily understandable by all with an interest. This is an important principle but one which is often elusive in practice. Because of the complexities involved and the many factors that need to be taken into account in ensuring a system that is fair, many systems find that their funding models have become enormously complicated and therefore lack transparency.

Subsidiarity

Decisions on resource allocation should be made centrally only if they cannot be made locally. Decisions on items of expenditure should be excluded from the School Global Budget only if schools do not control expenditure, if there is excessive variation of expenditure, if expenditure patterns are unpredictable, or if expenditure is once-off.

Accountability

A school that receives resources through the School Global Budget because it has students with a certain mix of learning needs has the responsibility of providing programs to meet those needs, has authority to make decisions on how those resources will be allocated, and should be accountable for the use of those resources, including outcomes in relation to learning needs. This implies the publication of information on student progress and on the value-added contribution of the school to student learning.

Strategic Implementation

The formulae underpinning the School Global Budget and any subsequent ongoing modifications should be implemented progressively over several years to avoid dramatic changes in the funding levels of schools from one year to another. In practice, given the political difficulties in redistributing funds, this means holding constant the funding of schools that in the past would have received more funds than they would be entitled to under new formulae while funding to other schools is increased as additional funds became available.

Structure of the Global Budget

The structure of the School Global Budget is summarized in table 3. The total recurrent budget for school education in the 1995–96 financial year was $1,814 million (US) of which a little over five percent ($96 million (US)) was spent on state administration, including the salaries of centrally and regionally based staff, administration and office accommodation costs, and a proportion of the costs of operating the Board of Studies.[1] Thus a sum of $1,718 million (US), or just under 95 percent of the total budget for school education, was made available for expenditure at the school level.

The total recurrent budget for school education in the 1995–96 financial year was $1,814 million (US) of which a little over five percent ($96 million (US)) was spent on state administration...

A further $US146m, or eight percent of total recurrent funds, was excluded from the School Global Budget, even though the costs are incurred at the school level. These funds were excluded because schools were not in a position to control their expenditure, or it was anticipated that there would be excessive variation of expenditure, or expenditure patterns were likely to be unpredictable. These included the costs of: busing students, which is the responsibility of another government agency; providing an education welfare allowance to poor families to assist them with unavoidable costs of schooling such as uniforms and books; meeting the salary costs of replacement teachers where there was an extended absence of the regular teacher; and the costs of providing school support services, such as speech therapists, psychologists, etc. who serve several schools.

This leaves a total of $US1,572m, or 87 percent of total recurrent funds, for school education which was provided directly to individual schools as the School Global Budget. This, in turn, was subdivided into seven sub-components, of which by far the largest was referred to as 'Core Funding,' a per capita

[1] The Board of Studies is a statutory body responsible for setting curriculum standards for students in government and non-government schools in all years of schooling and for assessment and certification of all students in years 11 and 12, the final two years of schooling.

Table 3.—Structure of the school global budget, Victoria: 1995–96 financial year

Component	$m	% total
School-level expenditure		
School global budget		
Core funding	1,314	72.5
Premises	98	5.4
Student disadvantage		
Disabilities and impairments	56	3.1
Special learning needs	22	1.2
English as a second language	25	1.4
Rurality and isolation	16	0.9
Priority programs	42	2.3
Total school global budget	1,572	86.7
Exclusions	146	8.0
Total school level expenditure	1,718	94.7
Non-school-level expenditure		
Administration	96	5.3
Total recurrent funding for government schools	1,814	100

SOURCE: Hill, unpublished tabulations.

allocation covering school operating costs and the costs of all teaching, administrative, and non-teaching support staff. The second sub-component was a per school rather than a per capita allocation for such costs as cleaning, the maintenance of buildings and grounds, and utilities such as water, sewage, electricity, and gas. The remaining five sub-components were included primarily to meet the educational needs of various categories of disadvantaged students. In the following sections, further details are provided of the approach taken to developing formulae for each of the sub-components of the School Global Budget.

Core Funding

For the 1995–96 financial year, funding to cover salary and operating costs within schools was based on a single per capita rate for primary students and a single rate for secondary students. The rate for secondary school students was set at a rate that was approximately 43 percent higher for secondary students than for primary students. Following extensive investigation of the actual pattern of internal allocation of funds within schools and after consideration of research evidence regarding the educational needs of students in different stages of schooling,

proposals have been made to move, in 1998, to a system of per capita funding of the core based on different weights at each grade level, as indicated in figure 1.

The proposed weights have been set at levels which reduce the differential between funding levels for students in primary and secondary schools, particularly at the point of transition between the two levels of schooling.

For the first two grades (Preparatory and grade 1), it is proposed that per capita funding levels be at least 20 percent higher than in grades 3 and 4. This is to enable smaller class sizes in the Preparatory grade (Blachford and Mortimore 1994) and the implementation of a comprehensive literacy strategy, including one-to-one tutoring in grade 1 (Clay 1991, 1993; Clay and Watson 1982).

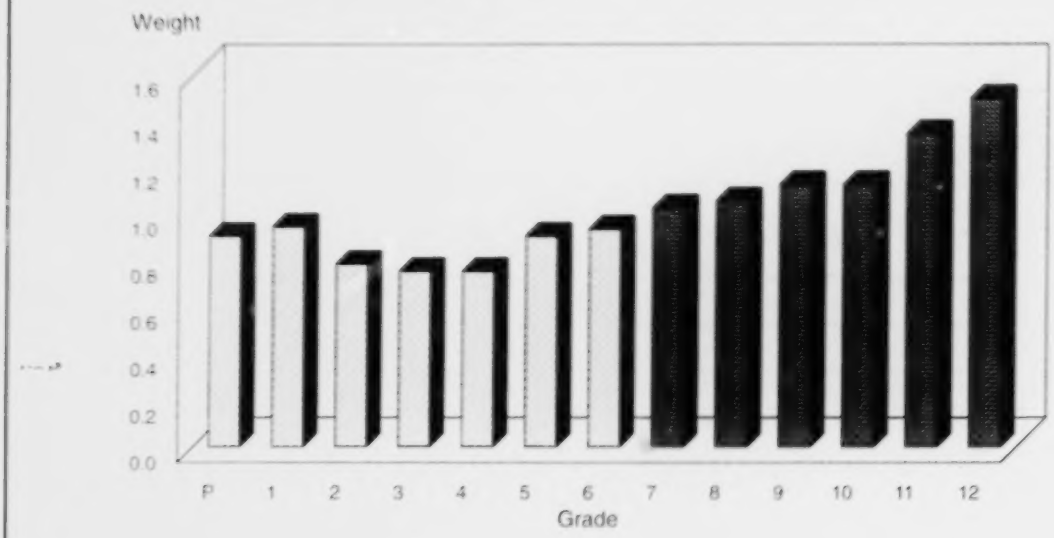
To obtain accurate estimates of program cost-effectiveness, an *Early Literacy Research Project* modelled broadly on Slavin and colleagues' *Success for All* program (Madden, Slavin, Karweit, Dolan and Wasik 1993; Slavin, Madden, Dolan, Wasik, Ross, and Smith 1994; Slavin, Madden, Karweit, Livermon, and Dolan 1990) has been mounted in a large sample of schools. Achievement levels of those in the intervention program are being compared with those of a matched sample of schools not in the intervention program.

During the middle years of schooling....it is recognized that the traditional models of primary and secondary education provision typically fail to meet the educational and developmental needs of young adolescents...

During the middle years of schooling, namely the final two years of primary education and the first two or three years of secondary education, it is recognized that the traditional models of primary and secondary education provision typically fail to meet the educational and developmental needs of young adolescents (ACSA 1996; Carnegie Council 1989; Capelluti and Stokes 1991; Eyers 1993; Hargreaves and Earle 1990). While an examination of 'best practice' approaches to middle schooling within the Australian context (Cumming and Fleming 1993; McKenzie and Taylor 1995) reveal no 'one best way,' they point to certain common elements, of which the most important as far as funding levels are concerned, involves interdisciplinary teams of teachers working with as few students as possible in as many subjects as possible. Accordingly, the proposed weights for grades 5 and 6 have been set at a higher level than those for grades 3 and 4 to enable common planning time for teachers in the final two years of the primary school. In addition, as noted earlier, the disparity in per capita funding for students in grade 7, (the first year of secondary school) as compared to grade 6 (the last year of primary school) has been greatly reduced. A steadily increasing gradient in the weights for grades 5 to 8 has nevertheless been built into the proposed set of weights, however, in recognition of the increasing teacher assessment and preparation time involved, the increasing need for smaller class sizes and the additional operating costs in specialist areas such as science, during the middle years.

A significant feature of schooling for older adolescents and young adults in grades 9–12 is the provision of a range of curricular choices, allowing students to explore and develop specific areas in depth and to pursue personal interests and strengths. Schools in Victoria typically provide a wide range of optional subjects in grade 9 and 10. In the final two years (grades 11 and 12), subject choice becomes even more significant as students select a relatively small number of subjects (typically six in grade 11 and five in grade 12) that they will study in depth. Choice and the availability of a full range of vocational pathways translate into significantly increased costs for schools. These costs arise from providing a comprehensive range of subjects despite relatively low enrollments in many and the need for relatively small class sizes in others.

Figure 1.—Proposed weights for the Core Funding component of the School Global Budget for regular schools



SOURCE: Hill, unpublished tabulations.

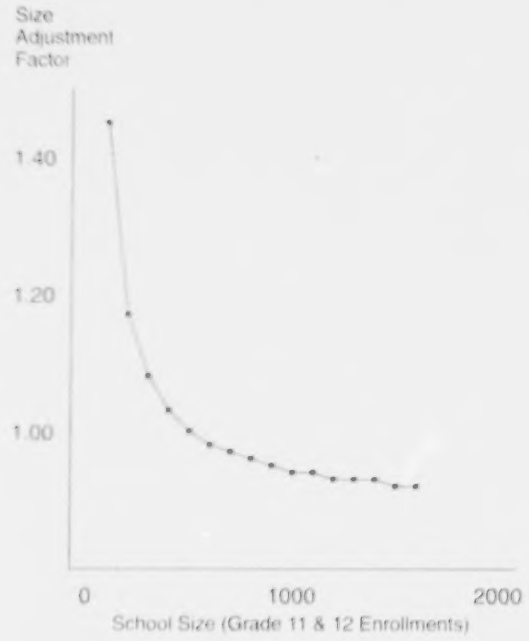
In addition, costs relating to tutoring, counseling, and remediation are higher than average during the later years of schooling, but increase significantly in grade 11 and yet again in grade 12 as demands increase for careers counseling, assistance with study skills, home support, monitoring progress and one-to-one or small group tutoring and guidance. Preparation and correction loads also increase dramatically as students prepare for their grade 12 examinations. Finally, the higher costs of materials and equipment are also factors which result in increased levels of expenditure in grades 11 and 12.

These factors are reflected in the proposed weights for grades 9–12 which have been set some 50 percent higher than those for grades 3 and 4 for students in grades 9 and 10, 80 percent higher for students in grade 11, and 100 percent higher for students in grade 12.

In addition to the weights shown in figure 1, it is proposed that there also be a size adjustment factor to reflect the additional costs of provision in schools with very small enrollments. This is particularly important in order to take into account small rural and isolated schools. At this stage, the appropriate size of this adjustment has been estimated for the final two years of schooling (grades 11 and 12) only. As indicated in figure 2, for a school with a grade 11 and 12 combined enrollment of 500 students, the size adjustment factor has been set at 1.0. The weights would be slightly less than 1.0 for schools with an enrollment of 1,000 students, but significantly greater than 1.0 for schools with an enrollment of 200 students.

To summarize, it is proposed that the formula for the Core Funding element of the School Global Budget contain two terms, a per capita amount weighted differentially according to the grade level of

Figure 2.—Size adjustment factor for grades 11 and 12 Core Funding



SOURCE: Hill, unpublished tabulations.

the student and a size adjustment factor to take into account economies of scale and additional costs of provision for schools in rural areas with small enrollments. This can be shown in the form of a general equation for calculating the entitlement of a given school for Core Funding, as follows:

$$\text{Core Funding} = f\left(\sum (w_j n_j X_j)\right)$$

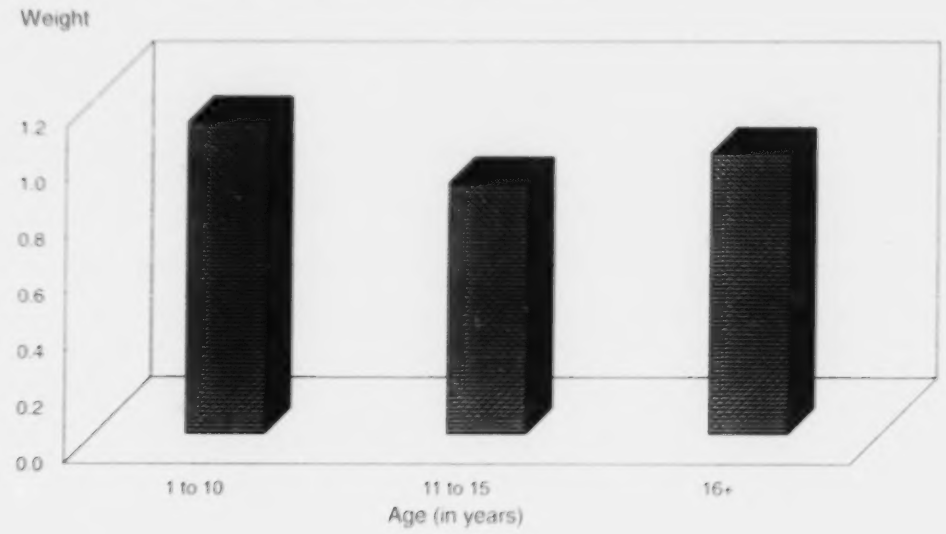
in which f is a size adjustment factor, w_j is the weight for grade j, n_j is the number of students in grade j and X_j is the overall per capita allocation in dollars.

Figure 2 applies to regular schools. Considerable work has been undertaken on a comparable approach to the provision of Core Funding to special schools for students with disabilities and impairments involving a simplified set of weights relating to different stages of schooling, shown in figure 3. Once again, a size adjustment factor will be necessary to accommodate schools with very small enrollments (less than 45 students).

Premises

The Premises component of the School Global Budget represents just over five percent of total expenditure on school education. It covers a number of site-related costs such as the cost of contract cleaning, utilities (e.g., heating, fuel, water, sewage, refuse, and garbage), maintenance of facilities and grounds, and minor works. For each of these components, there are separate formulae, with details of each school site contained on a central, computer-based School Assets Management System (SAMS).

Figure 3.—Proposed weights for the Core Funding component of the School Global Budget for special schools



SOURCE: Hill, unpublished tabulations.

The Premises component of the School Global Budget is a per school rather than a per student payment, although contract cleaning allocations are made on the basis of a formula that takes into account both the total area to be cleaned and the number of students occupying the premises. The formulae used are sensitive to the particular nature of each site. For example, the formula for maintenance and minor works distributes 50 percent of the available funds on the basis of the schools facilities entitlement area, 25 percent on the type of materials used in the construction of the school buildings, and 25 percent on the relative condition of those buildings.

Students with Disabilities and Impairments

Students with disabilities and impairments may attend a regular school or a special school. In 1996 there were 10,400 students (1.3 percent) of students receiving additional funding under this classification. The approach to funding students with disabilities and impairments has been to move towards additional resources to such students following a detailed assessment using an *Educational Needs Questionnaire* which assigns individuals to one of six levels of funding as shown in table 4.

At this stage, the above approach to funding has been implemented in regular schools only, but consideration is now being given to extending the approach to special schools.

Students with Special Learning Needs

This component of the School Global Budget targets students at risk of not making satisfactory progress due to family or other personal circumstances. Jordan, Lyons and McDonough (1992) conclude that of the various ways of allocating funds for "at-risk" students, the most efficacious method, in terms of stability, predictability, adequacy, efficiency, accountability, equity, responsiveness, and non-manipulability, is to make use of an index of need based on a composite of indicators. It was also

Table 4.—Funding levels for students with disabilities and impairments, 1996

Level 1	$US2,370
Level 2	$US5,505
Level 3	$US8,662
Level 4	$US11,820
Level 5	$US14,955
Level 6	$US18,112

SOURCE: Hill, unpublished tabulations.[7]

considered necessary to use predictors of achievement rather than achievement measures themselves, since direct funding of low achieving schools could remove the incentive to strive for high achievement.

A survey of students in grades 1, 3, 5, 8, and 11 was undertaken in a sample of 83 schools to identify appropriate indicators that best predicted 'at risk' students. Teachers were asked to identify those students whose literacy/English performance was well below that expected for his/her grade level. In addition they were asked to provide information on more than 20 potential predictors of poor achievement in literacy/English. Usable data were obtained for 7,233 students.

Using both structural equation modelling and multi-level regression modelling, it was established that the following indicators best predict learning difficulties at school at both the primary and secondary level in the Victorian context. Each is amenable to audit:

- *Poverty* (X_1) - as measured by whether or not the student is in receipt of an education welfare payment (Educational Maintenance Allowance or AUSTUDY);
- *Occupation* (X_2) - whether the highest breadwinner is unemployed, or is in an unskilled, skilled, white collar, or professional occupation;
- *Language spoken at home* (X_3) - whether or not a language other than English is spoken at home;
- *Family* (X_4) - whether the student is living with neither parent, one parent, or both parents;
- *Aboriginality* (X_5) - whether or not the student identified himself or herself as a Koorie (Aboriginal) student; and
- *Transient* (X_6) - whether or not the student has changed schools recently.

It was found that the use of a unit-weighted index for each student using the above measures resulted in an almost identical index to one based on factor score regression weights, and so unit weights have been used, except that it has also been found necessary to use a 0.5 weight for *Language spoken at home*, to avoid this measure dominating the index. The formula for the index is:

$$\text{Special Learning Needs} = X_1 + X_2 + 0.5X_3 + X_4 + X_5 + X_6$$

An eligibility threshold is applied to this index so that funds are allocated only to the 30 percent of schools with the most 'at risk' students. In the first year of implementation, measures of *Occupation* and *Family* were not used, but it is intended that they will be employed for the 1997 school year. This has involved the establishment of systematic and secure

data collection procedures for all enrolled students in government schools in a form that can readily be verified and collated for the purposes of allocating funds.

English as a Second Language

This component of the School Global Budget is directed at schools with large numbers of recent arrivals to Australia who do not speak English and require English as a Second Language (ESL) teaching. It is also directed at children from refugee families who in addition to experiencing language problems are likely to have experienced psychological trauma and a highly dislocated education. Proposed weights for these students reflect both stage of schooling and recency of arrival, with the highest level of additional funding going to recently arrived students in the later years of schooling. These weights are shown graphically in figure 4.

Once again, it is proposed that a funding threshold apply to the English as a Second Language index so that funds are directed to those schools with the highest need.

Rurality and Isolation

The geography of Australia with its high concentration of population in the capital cities and its sparse rural populations means that issues of rurality and isolation are of considerable significance.

An important difference between rurality, isolation, and other factors taken into account in the School Global Budget is that it applies to the total population of certain schools rather than to individual students. A further key difference is that the rationale for additional funding for rurality and isolation is related not to educational disadvantage but rather to the additional costs of provision. This has been established in a number of studies, particularly that reported in Tomlinson (1995). Thus, additional funding for the rurality and isolation component of the School Global Budget is provided in recognition of extra costs associated with curriculum provision, administration, and access student support services. In the Victorian context, rurality and isolation involves a number of distinct elements which have been used to construct an index for non-metropolitan schools comprising an equally weighted combination of:

- distance in kilometers from the Melbourne metropolitan area;
- distance from the nearest provincial center with more than 20,000 inhabitants; and
- distance from the nearest primary or secondary school, as appropriate, that is not eligible for funding as a rural or isolated school.

An important difference between rurality, isolation, and other factors taken into account in the School Global Budget is that it applies to the total population of certain schools rather than to individual students.

Funding for a given school is determined as follows:

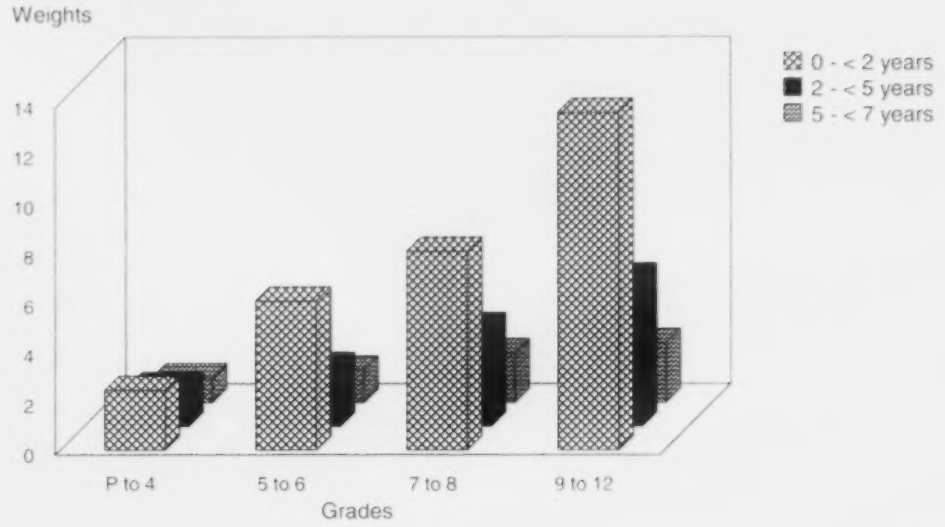
Location Index Funding = $375(US) + (Location Index Score X Student Enrollment X $43(US)).

In addition to the location index, there is a separate Rural Size Adjustment Factor to take into account the additional costs associated with operating a small school in a rural area. This funding is available to primary schools with enrollments up to 200 students and for secondary schools with enrollments up to 500 students.

Priority Programs

This component of the School Global Budget, which accounts for around 2.3 percent of total funding for school education, includes funds for a

Figure 4.—Proposed weights for the English as a Second Language component of the School Global Budget



SOURCE: Hill, unpublished tabulations.

number of state-wide initiatives and to enable schools to participate in specific purpose programs, including instrumental music programs, languages-other-than-English, programs for Aboriginal students, school restructure programs, etc. It also includes Teacher Professional Development Grant funds. It thus enables the government of the day to continue to fund strategic initiatives.

Discussion

The School Global Budget and associated funding arrangements being developed and introduced in Victoria, Australia, provide an important case study of the issues to be confronted in pursuing system-wide school reform and in ensuring as part of those reforms an equitable and cost effective approach to school financing for government schools. In this final section, some general reflections are made on the process of reforming school finances.

Perhaps the most significant point that can be made is that while recent developments have involved quite dramatic reforms, the Victorian developments build upon almost two decades of incremental change that has given schools increasing autonomy and accountability. For example, there is a long history of local school governance, with each school community electing a school council on which two-thirds of the members are non education system employees. School councils have responsibility for developing and approving the school's charter, approving the school's budget, managing finances, and reporting on the school's performance through the annual report. They now have significant additional responsibilities for a range of staffing decisions, including involvement in and final approval of the selection of the school principal.

This long history has not been one of smooth or easy change. Indeed, at all points along the way, change has been hotly contested and frequently

resisted. Many of the changes now being implemented were identified as desirable over a decade ago, but the political will and capacity to drive through a strong change agenda has been lacking. These same changes are able to be implemented at the present time because of the overwhelming electoral advantage enjoyed by the current government; an advantage that cannot last forever. This in turn raises the question as to whether the changes effected thus far are irreversible and whether some future government may want to centralize control again. The general view is that having given schools real control over local decision-making and resources it would be unlikely that any future government would see advantage in changing direction and re-centralizing unless strong evidence emerged of serious, unintended, negative consequences of the reforms.

In addition, there is also the general view that the system of school financing in Victoria, which had evolved over decades, had become excessively obscure and riddled with inequities and anomalies. The prospect of a fairer and more transparent system of funding has thus generated its own momentum for reform, even when it has been pointed out that the proposed changes may involve some pain for those schools that have faired relatively well under the old and less equitable funding arrangements. This leads to the second key observation, which is that fundamental reforms of school financing inevitably generate 'winners' and 'losers' and this places real limitations on the pace of change.

...principals...have found the pace of reform hard to accommodate and perceive that they have not had the degree of support that they would ideally have liked.

It is generally not possible to reduce significantly financial allocations to schools that in the past may have been 'over-funded' without generating an adverse political backlash. The alternative is to hold the funding levels of such schools constant until other schools have caught up, or to reduce funding to the appropriate level very gradually. This in turn implies that full implementation of new funding arrangements may take many years to effect and involve messy interim arrangements.

A recent survey of the attitudes of a random sample of Victorian government school principals to the Schools of the Future program generally and including specific questions on their attitudes to the School Global Budget, indicates that principals are reasonably positive about the benefits associated with the recent reforms to school finances (Steering Committee 1996, 31-32). In response to a set of questions concerned with the extent to which the School Global Budget has built up capacity within the school, principals indicated that they believed there is now a greater capacity to build a relationship between curriculum programs and resource allocation, to allocate resources to identified needs of students, and to achieve priorities as set out in the school's charter. On the other hand, in response to a further set of questions concerning the implementation of the School Global Budget reforms, principals indicated a more negative attitude to the time provided to adjust to the new approaches and levels of funding and to the degree of access to quality professional development for appropriate staff.

This suggests that while principals, along with most staff in schools, see merit in the reforms, they have found the pace of reform hard to accommodate and perceive that they have not had the degree of support that they would ideally have liked. This is despite the fact that there has in fact been a massive program of professional development in place to assist principals and other staff adjust to the new arrangements. This leads to a third key observation, namely that it is almost impossible to over-estimate the amount of professional development, training, and support services needed to sustain real reform.

Early on in the piece when the reforms were first being implemented, a very large number of principals took the opportunity to accept the offer of a voluntary departure package and to retire earlier than would normally be the case. Those that remained and those that took the place of those departing have clearly found the changes challenging. In other words, change has occurred at a considerable cost to those involved in implementing the new arrangements. But in view of the harsh reality of short electoral cycles and the reduced ability of governments to apply additional resources to smooth over the rough edges of change, are there any real alternatives to the 'crash through' approach to genuine reform?

A fourth key observation is that despite the pace and extent of the reforms thus far, the process in Victoria still has a long way to go and many issues remain to be confronted. At this stage, because there are more teachers employed in government schools than are required under the new funding arrangements, there is little capacity for many schools to make use of the staffing flexibility that they would enjoy if there were not teachers in excess of requirements. This problem is the source of considerable dissatisfaction at the school level. On the other hand, those schools that are not carrying teachers in excess are beginning to use their newly acquired staffing flexibility and to make strategic decisions, including appointing staff on term contracts, trading in a number of highly paid teaching positions for a larger number of teacher aides, offering a very attractive position to recruit a person with special qualities, and so on. The experiences of these schools points to the desirability of moving as quickly as possible to ensuring that all schools receive full staffing flexibility as soon as possible. This may mean declaring redundant those teachers who are in excess of requirements, an action that has not been taken thus far by the system.

Other challenges to be faced in the future development of the School Global Budget include approaches to funding the introduction of new information technologies in schools.

A related challenge concerns the method of charging for teacher salaries. For teachers in promotional positions, schools are allocated funds and charged at actual salary costs ('actuals in, actuals out'). For the 70 percent of teachers not in promotional positions, schools are funded and charged at average salary costs ('averages in, averages out'). This introduces an element of inequity into funding arrangements since schools in more affluent and favored locations tend to have the more experienced teachers at the top of the salary scale. Were such schools funded on the basis of average salary costs but charged on the basis of actual expenditure on salaries (averages in, actuals out'), they would be obliged to change the mix of their staff and employ a greater proportion of beginning teachers. In the longer term, it is the view of the Education Committee that all schools should move to an 'averages in, actuals out' system of funding, since this is a fairer system and also one that promotes the efficient use of resources. It is acknowledged, however, that this is something that would need to be phased in gradually, perhaps by extending the 'averages in, actuals out' method to all new appointments of teaching staff made by schools, but by retaining the 'averages in, averages out' method for all existing staff.

Other challenges to be faced in the future development of the School Global Budget include approaches to funding the introduction of new information technologies in schools. It is evident that we are now experiencing an awesome social and economic revolution as the Information Age becomes an increasing reality and as the power of the new information technologies transforms the home, the school and the workplace, breaking down many of the barriers that have thus far allowed these to exist as separate worlds. For schools, the costs of buying computers, of installing fiber-optic cabling, of creating local area networks, of

linking to the world-wide web, and of providing the necessary training and support service for teaching staff, are massive. Furthermore, it is not clear which are ongoing costs and which are once-off costs, or which should be borne by the school, and which by parents or the community at large. None of these costs have been properly factored into school budgets, yet there is some urgency to resolve how this should be done.

The final key observation relates to the extent to which the reforms to school financing as reflected in the Victorian experience, translate into educational benefits for students. The answer to this question has two parts. First, it is unlikely that the reforms to date will have had a significant impact on student achievement, nor would one expect such a direct effect in the short term. Rather, it is more realistic to expect that the effect of the reforms may be to build up the *capacity* of schools to better target resources to student learning needs and school priorities. The evidence to date from principals is that this may already be happening.

The other part of the answer relates to the other aspects of the school reform agenda that is being pursued through the Schools of the Future program. These cluster around three broad areas of reform that compliment the reforms to school financing, namely reforms directed at setting high standards and clear expectations in the curriculum, a package of reforms aimed at improving the professional capacity, status and competence of teachers, and a further package of reforms designed to strengthen the accountability of schools for the way in which they use resources to improve student learning. Real improvements in educational outcomes are likely only when schools focus on change at the level of the classroom and this means that changes to school financing arrangements must be related to a total package of reforms aimed at improving the quality of teaching and learning. There are encouraging signs in Victorian schools that this focus on classroom teaching is also starting to emerge, but at this stage it would have to be said that these signs represent the very early days of the next wave of school reform.

End-Note

The following note relates to table 2:

(a) Expenditure on provision of buildings and grounds is included. It is estimated that this amounts to $305 per student for Australia.

(b) Expenditure on super-annuation is excluded. It is estimated that this amounts to $US384 per student for Australia.

The expenditure used to derive the per capita figures specifically excludes:

- expenditure on sessional preschools and Technical and Further Education;
- private expenditure i.e., funds raised by schools, school councils or community organizations;
- expenditure on super-annuation, payroll tax, provision for long-service leave, depreciation and sinking fund payments, interest on Commonwealth loans, staff accommodation (including all payments to housing authorities);
- expenditure on accruals, provisions, commitments and liabilities;
- direct payment of allowances by the Commonwealth to individual students and/or parents;
- salaries of staff and operating expenses of student hostels, including hostel subsidies;
- expenditure on children in residential care programs;
- all known and clearly identifiable expenditure by government school systems on non-government schools.

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Alternative Options for Deflating Education Expenditures Over Time

Richard Rothstein
Lawrence Mishel
Economic Policy Institute
Washington, DC

About the Authors

Richard Rothstein is a research associate of the Economic Policy Institute, adjunct professor of public policy at Occidental College in Los Angeles, and contributing editor of *The American Prospect*. He edits an "education page" on the Electronic Policy Network (http://epn.org).

Rothstein authored, with Karen Hawley Miles, *Where's the Money Gone? Changes in the Level and Composition of Education Spending* published by the Economic Policy Institute (1995). He co-edited, with Edith Rasell, *School Choice: Examining the Evidence*, also published by the Economic Policy Institute (1993).

In addition to education, he also researches international trade and labor standards, and is a founding member of the Pacific Council on International Policy. Prior to his work at the Economic Policy Institute, Rothstein was a program analyst for the Los Angeles School Board, a high school teacher, and union officer.

Rothstein welcomes comments and inquiries about his work, via e-mail to <rothstei@oxy.edu>.

Lawrence Mishel is the research director of the Economic Policy Institute. He is the author, with Jared Bernstein and John Schmitt, of *The State of Working America, 1996–97*, published by the Economic Policy Institute (1997), and has authored previous editions of *The State of Working America*. He is also author, with Ruy Texeira, of *The Myth of the Coming Labor Shortage* (EPI, 1990); and of *Manufacturing Numbers* (EPI, 1988). He edited, with Paula Voos, *Unions and Economic Competitiveness* (EPI, 1992).

Mishel holds a Ph.D. in economics from the University of Wisconsin, and his articles have appeared in a variety of academic and non-academic journals. His areas of research are labor economics, wage and income distribution, industrial relations, productivity growth, and the economics of education.

Alternative Options for Deflating Education Expenditures Over Time

Richard Rothstein
Lawrence Mishel
Economic Policy Institute
Washington, DC

There is widespread interest in the problem of how to compare nominal education spending figures from different points in time or place. There are two distinct policy concerns involved:

a) Policymakers want to know if, at a single point in time, federal aid to education is being distributed fairly between localities. If the cost of education in different states or regions differs, then a given number of dollars in aid to one location will purchase a different quantity of real resources than that number of dollars in aid will purchase to another location. A similar question arises in large or diverse states, where the cost of living (and thus the cost of education) may vary considerably by urbanicity or geographic location. If these states seek to equalize spending or state aid between districts, an equalization of nominal dollars may not provide an equalization of real resources.

b) Policymakers want to know if, for a particular district, state or nation, the productivity of education spending is growing or declining over time. An industry's productivity grows if its outputs grow faster than its inputs. Education analysts have no satisfactory way to measure the industry's output, although test scores are used as a proxy. But even if this problem were addressed satisfactorily, we would still not know whether the productivity of education was growing or declining unless we can properly measure inputs. This is because, in any geographic location, the value of dollars spent will change over time because of inflation. Assume, for example, that measured school outputs have been unchanged from Year 1 to Year 2, but per-pupil spending has doubled. If inflation from Year 1 to Year 2 has been 100 percent, then school productivity will have been unchanged because output did not grow and neither did input (grow or shrink). But if inflation from Year 1 to Year 2 has been 50 percent, then school productivity would have been cut in half. Thus, the proper

measure of inflation is necessary to make accurate assessments of historical changes in education productivity. Because the willingness of the public and legislators to increase education spending is dependent, in part, on judgements about whether past increases have been well spent or wasted, a proper analysis of inflation has great practical importance.

This problem of making proper inflation adjustments as a basis for making judgements about productivity exists in all economic sectors, not only elementary and secondary education. In the public sector generally, there is widespread policy concern about the extent to which expenditures have apparently increased in recent decades, without an apparent corresponding improvement in the quality or efficiency of the services provided. Americans pay higher taxes and receive public services whose quality, when not in decline, does not seem to improve commensurate with our higher payments. It is not only school officials, but all government, whose credibility is low, in part because Americans believe their tax revenues simply disappear into a bloated, bureaucratic hole: In the last quarter century, government spending jumped from 26 to 31 percent of our gross national product, while schools are not noticeably better, police protection has apparently declined, mail is delivered less often, streets are dirtier, and roads have deteriorated. This apparent conflict between rising public expenditures and declining quality of public service may be one of the causes of the resistance to taxation which increasingly affects public decision-making. If inflation in public services has been greater than experts usually estimate or than the public perceives, then real expenditures in public services may have increased less than public debate assumes. A proper understanding of recent inflation in public services is critical to decision-making about future appropriations because legislators generally must decide how many future dollars would be required to provide real increases in services, over and above the funds required to offset inflation. In general, this estimate must largely be based on patterns of inflation from the recent past.

...there is widespread policy concern about the extent to which expenditures have apparently increased in recent decades, without an apparent corresponding improvement in the quality or efficiency of the services provided.

There is also widespread policy concern about the extent to which non-public human services expenditures have also apparently increased in recent decades, and there is great confusion in our public debate about the extent to which these expenditures represent real increases or simply compensate for inflation. The clearest example of this is in medical care: considerable political energy was expended in the last year over whether various proposals to budget more funds for Medicare represented "cuts" from previous funding levels or simply "restrained growth" in funding. Much of the debate over President Clinton's failed proposal to provide universal health care coverage concerned the extent to which various elements of his (and others') proposals would provide real new health care services to Americans, or would, instead, stimulate greater inflation in health care resulting in more money being spent for the same services.

In sum, there are two clearly distinguishable problems in education cost adjustment theory. The first is a cross-sectional problem: adjusting nominal dollars so that the real purchasing power of expenditures can be compared between different geographic locations at a given point in time. This is related to the widely appreciated differences in the "cost of living" in different areas. The second is a longitudinal problem: adjusting nominal dollars so that the real purchasing power of expenditures can be compared between different points of time for the same geographic location. This is related to the widespread appreciation of the effects of "inflation." For overwhelming practical reasons, solving these two problems may require different

conceptual approaches. We will return to this point later in this paper.

In a report we issued in November (Rothstein and Miles 1995), we began to deal with the problem of making longitudinal adjustments for inflation in education. Following a path suggested by William Baumol, we noted that inflation in school spending would normally be higher than the consumer price inflation with which most of us are familiar; so, to understand what portion of the nominal spending increases for education we should attribute to inflation, we sought to use a more appropriate index than the "consumer price index" used to measure inflation in the economy as a whole. For purposes of that report, we utilized a modified version of the "services" index calculated by the Bureau of Labor Statistics (BLS).

We will not review the details of that argument here, but have attached the relevant sections of that report as Appendices 1 and 2 to this paper. We plan to continue to work on these issues, and we know that others, more expert than ourselves, have done and continue to do important work here. In this paper, we state some of further questions we are now exploring and describe our current thinking about how to answer these questions.

The inflation rate chosen makes a large difference in one's measurement of school spending.

Question 1: *Does a specific inflation index for education mask the public choices we make?*

The report by Hanushek et al. (1994) states that productivity of public elementary and secondary schools is declining. Hanushek's analysis is based on his claim that real expenditures have tripled since 1960. This claim, in turn, assumes that it is appropriate to compare current expenditures to those in 1960 (and other years), after adjusting earlier expenditures by the "Gross National Product deflator." For practical purposes, this adjustment is similar to the more common adjustment made by other analysts (see, for example, Odden 1992, 10) who use the "consumer price index" to convert nominal to real dollar expenditures.

As noted, we have argued that because education is an inherently low productivity industry in the sense that cost efficiencies are hard to achieve, analysts should not assume education faces an average inflation rate. A consumer price index measures the average inflation of all goods and services, weighted by their importance in the consumption of urban families. A GDP deflator measures the average inflation of consumption, investment, government purchases and net exports in the economy. We suggest that a "net services" index corresponds more closely to the inflation facing industries such as education where cost efficiencies are hard to achieve.

The inflation rate chosen makes a large difference in one's measurement of school spending. Switching from the average consumption index, the CPI-U, to the net services index lowers the estimate of the real growth of per pupil spending over the 1967–91 period from 99.2 percent to 61.1 percent, a growth roughly 40 percent less. Using a GDP price index would suggest 121 percent growth, or double that shown if inflation were measured by net services.

In response, Hanushek and Rivkin (1996, 4) note that "if school expenditure is deflated by an output deflator—such as the GNP deflator—changes in the series of real expenditures indicate changes in society's resources that are devoted to education." This, they add, "yield[s] an indication of society's overall resource investment in schooling." Tracking society's investment is useful, but this is not the issue addressed in our previous report where we examined

how much the inputs into the education process grew: did schools have more teachers, books, facilities, etc. with which to educate students and from which we can expect better education outcomes? Hanushek and Rivkin's method can't answer this question.

Second, if education and GDP are both adjusted for inflation by the same index (the GDP deflator), then the computation of education spending as a share of GDP is equivalent to a simpler calculation where no adjustment for inflation is made (i.e., just use nominal dollars). That education's share of GDP in nominal terms is essentially what one expects given Baumol's disease, as would be true in many industries (depending on demand elasticities) which have low productivity. In these situations, more spending (proportionately) is needed each year in order to keep the same real resources (staff, facilities, etc.) available to students. It is possible that education's share of nominal GDP will grow while its share of real (inflation-adjusted) GDP will not, a manifestation of higher inflation in education.

Does this mean that the growth of education's share of GDP, or total spending, squeezes out other spending or consumption? It certainly means we spend more nominal dollars on education, but the pattern of productivity and inflation across sectors described by Baumol means that spending can decline in sectors with above average productivity growth.

The reason for attempting to measure inflation in education is to measure the growth of inputs...

Consider two extreme examples, education and personal computers. Because of different rates of technological change (see Appendix 1), inflation has been much higher in education than in manufactured products like personal computers. The cost of delivering education services has increased relatively rapidly, while the cost of comparable-quality computers has actually declined. Does the fact that we now spend more of "society's resources" on education mean that we must sacrifice spending on personal computers? Not at all. We can spend more on education precisely because we do not need to spend more on computers, as computers become less expensive.

In summary, we do not accept the Hanushek-Rivkin attempt to defend their adjustment of education spending by the GNP deflator, rather than a services deflator more appropriate to education, by arguing that this method best illustrates social choices. If one wants to analyze the growth of inputs available to schools then it is necessary to take into account the inherent difficulties of achieving cost reductions in education, a factor which leads to higher inflation facing schools. The fact that education's share of spending has grown is just another manifestation of Baumol's disease. The fact that education's share of nominal spending has grown tells us nothing about whether its share of real resources has grown.

Question 2: *Is the inflation in education best measured by examining changes in the prices of education inputs, like teachers and textbooks?*

In short, the answer to this question, we think, is "no," despite the fact that we ourselves use, in our own work, the term "inflation" to describe input price changes in education.

The reason for attempting to measure inflation in education is to measure the growth of inputs (i.e., translate increased spending on inputs into a "real" growth of inputs). There is no developed theoretical consensus about how to measure productivity (and thus inflation) in public or private services. In the manufacturing sector, the task is relatively straightforward. Economists calculate the value of enterprise shipments and subtract the cost of purchased inputs,

yielding a resulting "value added" which includes the productivity of the enterprise's labor and capital. In public sector services like schools or welfare services, however, there are no shipments generating revenues from which purchased inputs can be subtracted. Thus, we are faced with the challenge of directly deflating nominal value-added, a challenge not faced in the manufacturing sector where real value added is a residual after real purchased inputs are subtracted from real shipments.

Note that the private sector methodology depends on the valuation of both purchased inputs and purchased outputs. But there is no way to price the outcomes of education. Thus, were it even possible to accurately count the changing nominal prices of real resources purchased by schools (inputs other than employment related costs), and to separate these prices into a "real" component (increased resources) and a component which represents price increases for the same resource, we would still not have an estimate of real value-added because such an estimate requires a valuation of shipments or output which is unavailable in education.

...there is no way to price the outcomes of education.

Question 3: *Do price increases necessarily reflect "inflation" if the price increases do not result from either new resources or higher quality?*

As we hope to show, this is another way of posing the question which has recently been emphasized by Chambers and Fowler: "What is the difference between 'expenditure' and 'cost'?"

We begin to answer this question by asking why policymakers and the public want to know the education inflation rate. The reason, it seems to us, is "accountability." We want to know how much of the price increase of education (rising per pupil spending) is the "fault" of elementary and secondary institutions, and how much is beyond their control. If the price of education has gone up because school administrators have "had to" pay more for education inputs, our first inclination is to increase the amount of money we give schools, to compensate educational institutions for their higher expenses. But if the price of education has gone up because school administrators have chosen to spend more money, then we may want schools to demonstrate improved outcomes to justify this increased spending.

A complication arises, however, when we try to define what it means to "choose" to spend more money. Clearly, if administrators add more resources (for example, lowering class size by adding more teachers), this is a choice for which we hold administrators accountable—outcomes should improve as a result. Or, if administrators add more money by upgrading the quality of resources (for example, hiring teachers with more advanced degrees, or from more prestigious universities, for whom higher salaries must be paid), this too is a choice for which we should hold administrators accountable.

But what if per pupil spending goes up because school administrators decide to pay school teachers at above market rates? The higher salary level might be more than is necessary to attract the desired quality of college graduates into the teaching profession, or it might be more than is necessary to attract better quality teachers from neighboring school districts (because salaries in the district are already higher than those in neighboring districts). In these cases, economists would say teachers receive "rents" in addition to their market wages.

The question we pose is this: Should "rents" paid to teachers or to other education inputs be considered a cost over which education institutions have no control? When we apportion the increases in

prices of school inputs into the expenditures attributable to more (or higher quality) resources or to higher prices paid for the same resources, into which category should "rents" be assigned?

In our view, "rents," because they are within the control of education institutions and are not externally imposed higher costs, should be counted as real expenditures, not attributable to inflation. In other words, if school districts choose to spend more than is necessary for a given collection of education inputs, districts should be accountable to the public for improved results from such decisions, in a way that districts should not be held accountable for price increases of inputs which are beyond the districts' control. And, we emphasize again, when we say that districts should be accountable for unnecessary expenditures we do not suggest that these expenditures are wrong or that the public should prohibit them. Necessity is not the only basis for public decision-making. We would also add that the change in the size of "rents" in education over time may not be quantitatively large enough to materially affect inflation measures.

...if school districts choose to spend more than is necessary for a given collection of education inputs, districts should be accountable to the public for improved results from such decisions...

If we want, therefore, to define inflation in education as only those price increases over which education institutions have no control, we cannot calculate it simply by compiling a weighted average of actual prices paid by educational institutions for their various inputs. We must find a way to estimate what those institutions "would have" paid if markets for the provision of each of those inputs were fully competitive.

The distinction we make here is similar to that made by Chambers and Fowler (1995) and by Fowler and Monk (forthcoming) between "expenditure" and "cost." As they see it, "cost" is the minimum school districts must pay to obtain needed inputs. "Expenditure" is what school districts actually do pay, including what they term "discretionary" factors in payment. They have assumed, then, the challenge of constructing an education "cost" index which consists only of those prices schools must pay.

Thus, Chambers and Fowler describe districts' competition for teachers in terms (among other factors) of the concentration of teachers in a county who work for a single district. As theory predicts, they find that teacher salaries are lower where large percentages of teachers in a county are employed by a few large districts. Teacher salaries are lower where districts have monopsonistic power over their employment. This is shown in table 3.1 of Chambers and Fowler (page 37): in counties where the largest district has no more than 5 percent of total county enrollment (and thus, class sizes and other factors being equal, employs no more than 5 percent of the county's teachers), teacher salaries are 7.9 percent higher than in monopsonistic counties where all teachers are employed by a single county-wide district.

We differ with Chambers and Fowler, however, in that they consider that the single-district county has a teacher "cost" which is 7.9 percent lower than that of a district in the 5 percent enrollment category. In effect, they claim that the large district experiences a lower inflation rate than the small district. We, on the other hand, consider this negative rent imposed on teachers by the single-district county by dint of its monopsonistic power to be a "discretionary" factor. If we assume that prior-year expenditures for teachers in each district of type = 100 and we were to decompose per-pupil spending increases for the single-district county, we would still assign 7.9 percent of the teacher cost to inflation, for this represents an increased cost the district would have had to pay were it behaving in a competitive fashion. Because of its market power, this district is able to hold its per-pupil spending increases below the rate of

inflation, without any reduction in real resources provided to pupils.

We take the argument a step further. We can imagine a table similar to Chambers' and Fowlers' table 3.1 in which teacher costs were indexed, not by the concentration of enrollment (i.e., teachers) in a county's districts, but by the concentration of all college graduates in a county employed as teachers by school districts in that county. We suspect there would be similar results: counties in which a large proportion of college graduates were employed as school teachers would have lower average teacher salaries than would counties in which a small proportion of college graduates were employed as school teachers.

This suggests that to construct a specific education price index, it would be more appropriate to utilize, as the component representing teacher salaries, an index representing the prices (salaries) of all college graduates in a region who are substitutable for teachers. In other words, a teacher cost index, to reflect inflation in teacher salaries, should be based on the salaries of "comparable" workers, not on teachers alone. Only in this way can the effects of market imperfections in education be reduced.

...a teacher cost index, to reflect inflation in teacher salaries, should be based on the salaries of "comparable" workers, not on teachers alone.

We have used the example of concentration of teacher employment to illustrate these problems of calculating inflation because Chambers and Fowler have provided such useful data in table 3.1. However, we conclude this section of our discussion by observing that the concentration of teacher employment by a single district, or by all districts relative to other college graduates, is probably not the most significant "discretionary" factor which causes the actual increase in teacher salaries to deviate from the true inflation rate for teachers. The most significant market imperfection undoubtedly remains the cultural, historic, and current discriminatory practices that foreclose other traditionally "male" occupations to many female college graduates. This is probably the largest single factor causing salaries of college graduates generally to exceed salaries of comparable teachers. We cannot say whether, at the present time, this gender stereotyping causes a difference in rates of change in teachers' vs. comparable college graduates' salaries. But, to the extent that it does create different rates of change, an employment cost index that reflects comparable college graduates will contain a smaller proportion of women, and thus describe a truer measure of inflation, than an index of teachers alone.

While, as discussed in another section of this paper, we believe that a sectorally-specific inflation index may be too difficult to construct and may not be the most useful for policy purposes, we have no theoretical disagreement in principle with a sectorally specific index, an education price index. Our point here is only that, if an education specific index is desired, its component parts should not be the prices of the actual inputs used by schools, but should be the prices of "comparables" or "substitutables" (weighted by the relative importance of these inputs in education), because only by using such surrogates can the impacts of wage setting in education and its quality effect be judged. Only in this way can an inflation index tell the public how much more schools have "had to" pay for similar resources.

Question 4: *Can an education price index be properly used to interpret changes in spending for components of education spending?*

Hanushek and Rivkin not only adjust total per pupil spending by the GNP deflator, based on the argument on "opportunity costs" described above, they then go on to adjust specific components of

education spending by this deflator as well, an operation which we can't understand, even in their own terms of social choices. Thus, they note, the real inflation-adjusted (based on the GNP deflator) "daily wage" of teachers has risen from $34.20 in 1890 to $182.80 in 1990. We regard the deflation of one specific input, like teacher salaries, by an economy-wide deflator as being even less meaningful than the deflation of a single sector like education by an economy-wide deflator. Indeed, we think that it is not even meaningful to deflate the input by an education specific deflator.

Assume that we have an education price index (or as we suggest below, a broader services index) by which we can track changes in real education spending over time. What if we want to know how much teacher salaries have risen over time or how many teachers can be hired based on a certain salary pool—what deflator should we use?

Our answer to this question depends on why we want to know. Here are the possible answers:

- If we want to know whether teachers generally are overpaid or underpaid in market terms, we would calculate their real salary patterns using an employment cost index for comparable workers (college graduates). As explained in the previous section, use of such an index would effectively explain whether schools were using monopsonistic power to "underpay" teachers, or whether teacher unions were using monopolistic power to win "rents" for teachers.

- If we want to know whether teachers pay has kept up with (or exceeded) the "cost of living," we would deflate their salaries by the consumer price index, for this would tell us whether their salaries in different periods enabled them to purchase more or less of the typical collection of goods and services purchased by urban consumers.

- If we want to know whether teacher salaries are a greater or smaller share of total school expenditures than they were in an earlier period, we would not deflate the salaries at all. We would simply calculate the share in nominal terms. Note here that, as we described above, if teachers represent a greater share of all school expenses, this does not represent districts' greater opportunity cost for hiring teachers. If the employment cost index for comparable college graduates rose faster than the overall education cost index, and if the book publishing index rose more slowly than the overall index, districts could spend a relatively larger share of their total expenditures on teachers, and a relatively smaller share of their total expenditures on textbooks, without having to give up real textbook resources in order to meet their teacher payrolls.

...inflation rate for services like education was an average of 6.7 percent a year, compared to 5.8 percent for consumer purchases and 5.4 percent for the GNP.

Question 5: *Should the "Net Services Index" be extended and made more generally available?*

In *Where's the Money Gone?* we calculated the real growth of per pupil elementary and secondary education spending from 1967 to 1991 by subtracting the cost increases attributable to inflation. As table 1 shows, we concluded that the inflation ratefor services like education was an average of 6.7 percent a year, compared to 5.8 percent for consumer purchases and 5.4 percent for the GNP.

Since the publication of his result, we have received inquiries from many scholars and practitioners who wanted to know if we could either provide a "net services index" for other locations and/or time periods, or whether we could provide a relatively simple guide for how these scholars or practitioners could make the calculations themselves.

Table 1.—Growth in per pupil spending using different inflation measures, 1967–91

	Per pupil spending			
	Current dollars	1991 dollars using net services index	1991 dollars using CPI-U	1991 dollars using GDP
Year				
1966–67	$687	$3,456	$2,794	$2,513
1990–91	5,566	5,566	5,566	5,566
Change, 1967–91				
Dollars ($)	4,879	2,110	2,772	3,053
Percent (%)	710	61.1	99.2	12.2
Inflation				
Total (%)		403.7	306.7	265.8
Annual (%)		6.7	5.8	5.4

SOURCE: Rothstein and Miskel, unpublished tabulations.

We made these calculations for the nation as a whole, as well as for each of 9 sample districts. We calculated inflation by taking the "Services" index published by the BLS, and then removing from this index the items attributable either to medical care or to shelter rent. In practice, because the BLS already publishes a "Services, Less Medical Care Services" index, it was necessary for us to remove the shelter rent components, using raw data provided to us by the BLS. The specific methods used are described in Appendix 2. The process was cumbersome and time consuming, largely because the weights of rent and medical care in the overall services index changed at various times during the 24 year period we studied.

After all this was done, however, we found that the "net services index" rose at approximately the same rate as the "services" index before medical care and shelter rent were extracted; over the entire 24 year period, the services index rose less than 1 percent more than the net services index. (With 1967=100, the 1991 index number for net services (national) was 503; for all services (national) it was 508). While medical care services had more rapid inflation than services generally, shelter rent had less rapid inflation than services generally, and these mostly cancelled each other out.

This was also the case for the local indices we constructed, but to a lesser extent. Some local net services indices varied by as much as 8 percent from the corresponding local services indices. Still, these were not large differences over a 24 year period. Thus, we concluded, given the parallel trends, that it might be easier for future research simply to rely on the service index.

We emphasize, however, that the rough correspondence between the services and net services index, both nationally and in sub-national areas, is purely coincidental. There is no economic phenomenon that we can think of that would explain why shelter rent and medical care inflation would move in opposite directions of roughly the same magnitude. If indices were desired for other locations, or other time periods, the coincidence might be duplicated or it might not.

We are currently in the process of updating the net services index for the 1995–96 school year, and

will be interested in seeing whether the coincidental correspondence of the services and net services index continues to hold in the more recent period. If we could be confident that the unamended services index presented an accurate reflection of inflation in elementary and secondary education, this would greatly simplify our work and that of other analysts.

We hope to test the correspondence of the services and net services index for as many years prior to 1967 as it is possible to do. We also hope to test this correspondence for intermediate periods, such as periods dating from 1970, 1975, 1980, and 1985. If the rough parallelism holds for these earlier and intermediate periods, we would recommend use of the easily accessible services index for adjustment of "real" education expenditures.

This will not enable us to understand the growth of education spending as far back as 1890, as Hanushek and Rivkin wish to do, but it will cover most of the years with which current debates about education productivity are concerned. An index going back to 1890 would necessarily be speculative, based not so much on data, as on investigations of economic historians whose interpretation of economic trends might be used to establish relationships between a surrogate services index and the growth of GNP.

...we urge the use of a broader services-type index which reflects inflation in services like education.

Question 6: *Is the "Net Services Index" (or all services index) preferable to a specific education price index for understanding inflation in education?*

We think yes, for two practical reasons. First, because government statistical agencies, like the BLS, have not published or even computed price indices which use the relative importance of specific education inputs, we believe it to be practically impossible for education researchers to reconstruct the prices of comparable inputs sufficiently far back in time to be useful. The only effort to do so, that of Kent Halstead (1983), resulted in an education price index going back only to 1975. Since, for example, considerable public debate now takes place about education's purported productivity decline since the 1960s, Halstead's index is not adequate to inform participation in that debate.

We do not, however, disagree with current efforts to create a cross sectional cost of education index, without historical data, such as that partially proposed (for teachers) by Chambers and Fowler (1995). Indeed, we are great admirers of these efforts. As we indicated earlier, these remarkable efforts will prove enormously useful to equalization and other fund-distribution tasks. But examination of the enormity of the task attempted in Chambers and Fowler must lead to the conclusion that such a task would not be possible for historical data, with its need for very specific data on things like crime rates, amenities, etc. Therefore, even if desirable, construction of such an index for understanding inflation is not practical.

As a more practical alternative, we urge the use of a broader services-type index which reflects inflation in services like education. While such an index may differ in important respects from a more specific education index, both in the types of inputs counted and their relative importances, this index is likely to be a more accurate surrogate for a sectorally specific index than anything else now available or likely to be so. It is certainly likely to be more accurate than either the consumer price index or the GNP deflator, which most education analysts have inappropriately been satisfied with.

Second, problems of inflation affect not only education but other similar human services: child

welfare services, law enforcement services, etc. Given the difficulty of constructing a sectorally specific education index going back very far in time, it is practically inconceivable that analysts could develop similar indices for each of these sectors. It should be relatively easy to test whether the types of inputs and their relative importances are similar in each of these human services. We suspect that they are and if this suspicion is correct, public policy debates would benefit considerably from having a single human services index that could be used to understand how the real costs of human services in education and other similar sectors have changed.

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Appendix 1

Inflation and the Measurement of School Spending

In 1967, public elementary and secondary schools spent $29.6 billion, or $687 per pupil enrolled in grades K–12. By 1991, spending jumped to $229.4 billion, or $5,566 per enrolled pupil. However, the fact that per pupil spending grew by 710 percent over this quarter century does not tell us the degree to which we have devoted more real resources to education. Much of this increase has been caused by inflation: the prices of most goods and services purchased by schools have gone up each year.

For instance, if food prices rise by 5 percent, families must increase their food budgets and expenditures by 5 percent just to maintain their food consumption. Similarly, schools faced with a 10 percent rise in the price of textbooks must increase textbook spending by 10 percent to provide students with the same number of textbooks. To measure historical growth of real per pupil resources requires knowledge of the inflation, or price increases, in goods and services purchased by schools. What we want to understand is the degree to which more real resources are now used by schools and, if so, whether greater resource intensity generates better outcomes.

Examinations of changes in school spending over time must use some measure of inflation to convert 1967 spending to its equivalent in 1991 dollars. We can then speak of "real" (or "inflation-adjusted") as opposed to "nominal" ("unadjusted") school spending growth. Most analysts make this conversion by use of the "consumer price index for all urban consumers" (CPI-U), the conventional measure of inflation provided by the BLS.[1] Using the CPI-U, $687 in 1967 dollars becomes $2,794 in 1991 dollars. In real terms, therefore, per pupil expenditures went from $2,794 to $5,566, or a quarter-century jump of 99 percent. As Benno Schmidt claimed, we "roughly doubled" real school spending.

It is probable, however, that use of the CPI-U for this purpose causes an overstatement of school spending growth. The inflation rate for school purchases is likely to be greater, and will continue to be greater, than the average urban consumer's price inflation that the CPI-U is intended to measure. Table 2 reviews inflation rates for a range of goods and services. These data show that price increases for particular items can be different from price increases for the "average" items included in the market basket of goods and services used to calculate the CPI-U. For instance, inflation in medical care (681 percent) from 1967 to 1991 was much greater than the average for all items, while inflation in commodities like food and manufactured products (344 percent) was less than the average. Because inflation rates vary widely among particular items, it is important to determine carefully the appropriate inflation index to use for converting nominal spending into real changes.

If a family bought the average market basket of goods and services in 1967, and then spent 408 percent more in 1991, it could still buy similar goods and services in 1991 because "all items" inflation was 408 percent. But consider a family that purchased an above average amount of medical care in 1967 and whose total spending also increased by 408 percent by 1991 (i.e., less than the medical inflation of 681 percent). In order to maintain its standard of living in other respects, this family would have been forced to reduce the amount of medical care services (or an equivalent amount of other spending) it purchased by about a third, because medical care prices rose faster than average prices. In contrast, consider a family that purchased an above average amount of commodities in 1967 and whose spending also increased by 408 percent by 1991. This family could improve its

[1] Eric Hanushek deflates school expenditures using the "GNP deflator," not the consumer price index (CPI) (Hanushek et al. 1994; Chubb and Hanushek, 1990). The GNP deflator, however, suffers from drawbacks that are similar, though not identical, to those of the CPI. A GNP price index reflects the prices of all components of final demand (consumption, investment, government purchases, exports, and imports) and is no more representative of school input prices than is a consumption index like the CPI-U. Schools are unrepresentative of average users of final product as they are unrepresentative of urban consumers.

Table 2.—Selected inflation rates, 1967–91

	Inflation index (1982–84=100)		Inflation
	1967	1991	1967–91 (%)
All items (CPI-U)	33.4	136.2	308
All commodities	36.8	126.6	244
Food	34.1	136.3	300
Other commodities	38.6	121.3	214
All services	28.8	146.3	408
Medical care	26.0	177.1	581
Other services	29.3	143.3	389

SOURCE: Indices from Bureau of Labor Statistics (BLS) as presented in *Economic Report of the President* (February 1995), Table B-61, p. 344.

living standards, purchasing significantly more commodities (or other items), because commodity inflation (344 percent) was relatively low.

Table 2 also shows that prices for commodities have grown more slowly than prices for all services (344 percent vs. 508 percent). A similar contrast is evident when food and medical care are removed from their respective groups: nonfood commodity (primarily manufactured goods) inflation was 314 percent, roughly two-thirds the 489 percent inflation in "services other than medical care."

Inflation in services exceeds inflation in goods or commodities because productivity (the increase in output per employee hour worked) has grown more slowly in services. Productivity growth in manufacturing, for instance, has allowed industrial firms to reduce their costs (or at least slow the growth in costs) and therefore increase the prices of manufactured products more slowly or not at all. In contrast, many service-sector firms cannot automate their production as manufacturers do; these service firms, for whom it is more difficult to achieve productivity growth, have had to increase prices faster than average. Often cited examples include barbers and orchestras: barbers cannot greatly increase the number of haircuts they perform per hour, and orchestras cannot perform music with fewer musicians each year. These insights—that disparities in inflation mirror differences in productivity growth, and that industries (i.e., services, barbers, orchestras) in which it is hard to achieve productivity growth will have higher than average inflation—are associated with the work of William Baumol (Baumol 1967; Baumol, Blackman, and Wolff 1989). Baumol refers to low productivity sectors as having a "cost disease," and the faster inflation in sectors with relatively slow productivity is generally referred to as the "Baumol effect." Table 3 elaborates how differences in productivity between industries will, in the context of a national labor market, generate differences in inflation rates. Table 3 also illustrates how differences in the price changes (i.e., inflation) of individual industries are driven by differences in productivity growth when all industries increase wages at the same rate, as would be expected in a national labor market, assuming each industry's workforce has the same skills and education. Table 3 presents examples of two industries, each of which has 100 workers producing 1,000 units in year one. That is, the examples are constructed so that both industries have the same produc-

Table 3.—The relationship between industry prices and productivity in a national labor market

	Industry A "Fast productivity"			Industry B "Slow productivity"		
	Year one	Year two	Percent change	Year one	Year two	Percent change
Employment	100	100	0	100	100	0
Output (units)	1,000	1,100	10	1,000	1,000	0
Productivity (2)/(1)	10	11	10	10	10	0
Annual pay	$20,000	$22,000	10	$20,000	$22,000	10
Price*	$2,000	$2,000	0	$2,000	$2,200	10

* (annual pay X employment)/output units

SOURCE: Rothstein and Miles, unpublished tabulations.

tivity level of 10 in year one. Because each industry also pays its workers the same (i.e., $20,000), they also have the same price level in the first year of $2,000 per unit.

What happens to the prices of the goods produced in these industries when one industry (Industry A) experiences a 10 percent increase in productivity but the other industry (Industry B) has no productivity growth? We assume that wages increase by 10 percent (reflecting the 5 percent average productivity growth in the economy—the average of 10 percent and zero percent—and five percent inflation). In Industry A, the productivity growth of 10 percent offsets the 10 percent wage increase so that prices do no increase in year two. Industry B, however, enjoyed no productivity growth but did face 10 percent higher wages, the same as Industry A. The result is that the price of Industry B's goods increased by 10 percent. Thus, an industry that pays comparable wages, for comparable workers, but has low productivity, will experience faster inflation.

Education is subject to the Baumol effect because productivity improvements from cost reductions are difficult to achieve in education. In contrast, manufacturing and telecommunications industries are able to automate work and find efficiencies in use of materials; and thereby reduce the resources needed in production and realize productivity gains. From 1967 to 1991, the private sector achieved productivity growth of 1.1 percent per year, or 30 percent overall. This means that the number of workers necessary to produce an average product fell roughly a third from the beginning to the end of this period. What would a comparable growth in labor productivity look like in schools? Assume that schools use only one resource, teachers, and the pupil-teacher ratio was 20:1 in 1967. Then, if 30 teachers were necessary to educate 600 students in 1967, and if schools could have increased productivity the way the private sector did (by reducing labor inputs and using remaining inputs more efficiently), a 30 percent productivity growth would imply that only 23 teachers were necessary in 1991; in other words, the pupil-teacher ratio would have to *rise* from 20:1 to 26:1. With only 23 teachers, school cost increases would be in line with the national economy.[2]

[2] Not all productivity gains come from reducing employment. Some gains can be made through work re-organization.

While education reform should certainly be on the public agenda, continuous industrial-like realization of cost efficiencies are probably not what the public has in mind. Education costs will rise faster than economy-wide inflation, so real spending per pupil as measured with an average inflation index will rise even though per pupil resources are not growing.[3] This is illustrated in table 4. This table illustrates how spending per pupil will necessarily rise if there is not any productivity growth or increase in cost efficiencies. For instance, a school with a pupil/teacher ratio of 20:1 that pays teachers $20,000 annually will be spending $1,000 per pupil, assuming, of course, there are no expenses other than teachers. If wages in the economy, and for teachers, grow 10 percent, then spending per pupil will also rise 10 percent, to $1,100. The cost efficiencies necessary to offset higher wages require that the number of pupils per teacher rise to 22.2. Schools are then faced with a continuous rise in number of pupils per teacher or steadily rising spending per pupil, a measure of school costs or inflation, at least when compared to other sectors that can achieve greater cost efficiencies over time.

A related insight of William Baumol is that because productivity improvements are spread unevenly throughout the economy, changes in prices over time will also vary across products. Consumers, therefore, will spend a greater share of incomes to purchase a constant level of products or services in some sectors and a smaller share to purchase a constant level in others. That is, we must increasingly spend a larger share of our incomes on low productivity goods and services that have more rapid price increases (like education) just to maintain the same level of consumption.

It is thus inevitable that inflation in a low productivity industry like education will be higher than inflation in an average industry experiencing average productivity gains. For this reason, use of the average inflation rate for consumer goods and services (the CPI-U) systematically understates the inflation facing school districts. Put another way, a measure of average inflation to deflate school spending trends will systematically mislead by overstating how much "real school spending" has grown. It will give the impression that more of the nominal spending growth represents real new resources provided to school districts for educating students, and that less of the nominal spending growth represents inflation, than was in fact the case. The issue, then, is whether we can select a more appropriate index to use for analysis of school spending.

Despite problems with use of the consumer price index to interpret historical changes in school spending, few researchers have attempted to create an inflation index specifically tailored to education (although the education research community is increasingly sophisticated about regional differences in the cost of living, a conceptually similar issue).[4] Kent Halstead constructed one index that extends back to 1975 (Halstead 1983 and Research Associates 1993), but no others have attempted to replicate Halstead's work, so its accuracy lacks independent verification. Halstead's index has a theoretical drawback that further militates against its use in the present study.

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[3] School productivity gains, therefore, must be thought of as the achievement of higher test scores (and other improved outcomes) as real expenditures steadily increase (assuming the use of an average inflation rate).

[4] School price adjustments are now used by education policymakers to evaluate geographic differences in education expenditures. Concerned with intrastate equalization of school spending, policymakers want to know whether the same dollars purchase similar collections of school inputs in different districts. As early as 1980, Jay Chambers proposed creation of a "cost of education index" to assist California officials in equalizing school funding after the state Supreme Court's *Serrano* decision mandated reform (Chambers 1980). Texas, Florida, Alaska, and Ohio now adjust aid to local school districts for intrastate regional differences in the cost of education inputs (McMahon 1995). The U.S. Department of Education has commissioned analyses of state and region differences in costs of education, calculated from differences in costs of living, amenities, and other factors, for the purpose of determining how school districts' federal aid might be adjusted so that federal dollars have equal purchasing power (Barro 1994; Parrish, Matsumoto, and Fowler 1995). Despite this sophistication regarding geographical differences in purchasing power of nominally equivalent dollars, little effort has been devoted to construction of a historical school price index to replace the CPI-U in school finance debates.

Table 4.—The relationship between spending per pupil and productivity

	Year one	Year two	
		No productivity	Productivity growth
Pupils	1,000	1,000	1,000
Teachers	50	50	45
Pupil/teacher	20	20	22.2
Total annual pay	$20,000	$22,000	$22,000
Salaries*	$1,000,000	$1,100,000	$990,000
Spending/pupil	$1,000	$1,100	$990

* Annual pay of $20,000 multiplied by the number of teachers.

SOURCE: Rothstein and Miles, unpublished tabulations.

Halstead constructed his school price index (SPI) by examining price changes for a "market basket" of 42 items typically purchased by elementary and secondary schools in 1975 (Halstead 1983, 138). In 1975, elementary and secondary schools spent 47.68 percent of their budgets on teacher salaries, 3.75 percent on student transportation, 0.7 percent on textbooks, and 1.1 percent on electric power, etc.[5] By assembling a price series for each of these items, making estimates where necessary, Halstead calculated what it would cost public schools to buy an identical (ignoring most quality improvements) collection of goods and services in each subsequent year. He identified this growth as the school inflation rate, so spending above this rate represented real spending increases.

The Halstead index is not used in this report for two reasons. First, it is not available for the entire 1967 to 1991 period, and second, its treatment of teacher salaries is questionable. Halstead's SPI includes a price series for elementary and secondary teachers based on their actual salary changes. However, what schools pay teachers reflects districts' choices about whether to pay teachers more or less than comparable workers. These choices may be influenced not only by district officials but by legislators and teacher unions as well. When teacher salaries rise relative to salaries of workers with comparable education and experience in other fields, we can presume that schools are upgrading the skill levels of their workforce (in other words, providing additional inputs, more "real" resources to students). But if teachers' salaries fall relative to those of similarly educated professionals, then school districts will have a harder time attracting the best qualified teachers, and there will be an erosion in the teacher skill base. Variance from market norms can be considered either an effort to attract a better (or worse) than average quality workforce, or the provision of a "rent" (positive or negative) to teachers by either overpaying or underpaying them.

It would have perhaps been more appropriate for Halstead to base his index on all college-educated or professional workers, a group "comparable" to teachers. Then, the degree to which schools pay teachers or other school employees more than the market rate would not be obscured by a school price index that ignores the salaries of comparable workers. Conversely, a fall in teacher pay relative to "comparables" would result in a measured decline in

[5] Halstead's weights were based on data collected by the National Center for Education Statistics, but NCES stopped collecting such data in 1976.

real resources provided for students. In the absence of a conceptually correct index, an assessment of real school spending must rely upon some combination of available indices for particular items developed for the CPI-U. One reasonable choice is to use the inflation measure for "services," because schools are a service type industry with "cost disease"/slow productivity characteristics. The actual service index of the CPI-U, however, includes two heavily weighted items that strongly affect the measured inflation rate but that are not relevant to education. Shelter rent (housing) inflation makes up a large part of the service CPI-U and should be excluded. Medical care also has an exceptionally high inflation rate caused by unique characteristics of the health care sector that are not applicable to education. For this reason, the index developed for this report—the "net services index" (NSI)—reflects price increases of services provided to consumers exclusive of shelter and medical care. "Net services" includes items such as entertainment services, personal care services, personal and educational services, public transportation, auto repair, private transportation (other than cars), housekeeping services, and utilities and public services. These tend to be labor-intensive services with low productivity growth (relative to goods or to the average) and therefore are items where increased cost efficiencies are hard to achieve. If schools rely on professional, college-educated workers more than do the sectors in "net services" (as is reasonable to believe), then "net services" will still understate school inflation (because wages for educated workers have risen faster than average over the 1967–91 period). Appendix 2 provides technical detail on how the NSI was constructed, nationally, and for each region and local area.[6]

Application of the national net services index to education spending is shown in table 5. These data show that the $687 spent per pupil in 1967 was equivalent to $3,456 in 1991 dollars. Since 1991 per pupil spending averaged $5,566, we conclude that real school spending—real per pupil resources provided to schools—increased by about 61 percent.[7] Table 5 also shows measured growth in real school spending using the "all items" CPI-U to be 99.2 percent—the much discussed "doubling" of school spending. Selection of the net services index suggests a nearly 40 percent slower growth in school resources than conventional accounts based on the conceptually inaccurate (for this purpose) "all items" CPI-U.

In sum, choice of an inflation measure dramatically affects the portrait of school spending growth. The magnitude of the measurement error from applying the "all items" index cannot be precisely determined because an appropriate school index is not available, but construction of an index from the CPI-U services component, with medical care and housing excluded, seems to be the best alternative. So while it seems certain that conventional estimates have vastly overstated the growth in school resources, the 61 percent growth presented in table 5 is an estimate that, while more accurate than conventional estimates, might still be too high or too low. Development of an improved inflation index for school spending should be a research priority.

[6] Inflation differs not only for different products or services; they also differ for the same products and services in different localities, because price increases in different localities at different rates. Therefore, we have constructed a regionally appropriate NSI for each of the nine sample districts in this study.

[7] Coincidentally, national inflation in "net services" from 1967 to 1991 was almost identical to inflation in the broader services category, which includes shelter rent and medical care. We, nonetheless, removed rent and medical care in the construction of the NSI, believing this to be the most theoretically justifiable approach. This coincidence, however, means that our conclusion about the real national growth of school spending (61 percent from 1967 to 1991) is unaffected in practice by this decision to construct an NSI to replace the all-services index of the BLS. Note, however, that this coincidence may not be true for the regional NSI's we construct.

Table 5.—Growth in per pupil spending using different inflation measures, 1967–91

	Per pupil spending		
	Current dollars	1991 dollars using net services index	1991 dollars using CPI-U
Year			
1967	$687	$3,456	$2,794
1991	5,566	5,566	5,566
Change, 1967–91			
Dollars ($)	4,879	2,110	2,772
Percent (%)	710	61.1	99.2
Inflation			
Total (%)		404	308
Annual		7.0	6.0

SOURCE: U.S. Department of Education. 1994. *Digest of Education Statistics, 1994*. Washington, DC: National Center for Education Statistics. Tables 3 and 32.

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Appendix 2

Construction of the Net Services Index

Appendix 2 presents technical information on how the NSI was computed at the national and subnational levels.

The National Level

The NSI represents inflation in services other than rent/shelter or medical care. The BLS does not publish such an index—there is one for "services", for "services less medical care" and for "services less shelter" but not for "services less shelter less medical care." It was necessary, therefore, to derive an NSI; we appreciate the assistance we received in this regard from BLS economist Patrick Jackman, who computed the national NSI for this project. He did so by combining the "relative importance" and price changes in particular periods for "services less shelter" and "medical care" to derive "services less shelter less medical care."

For instance, using the "relative importance" for December 1977 and the inflation rates between December 1966 and December 1977, one can derive the "relative importance" for December 1966. This calculation was made for "services less rent" and "medical care," which allows a computation of the "relative importance" for their difference, net services. The growth in relative importance of net services provides the measure of net service inflation for the period December 1966 to December 1977. The same process was repeated for the 1977–82, 1982–86, and 1986–90 periods. The inflation rates of each period were chained together to obtain an index value for December 1966 and December 1990—the net services index rises from 100 to 503. This inflation rate is almost identical to that of services as a whole, whose equivalent value in 1991 (with December 1966=100) is 508.

Subnational Indices

Inflation rates can differ substantially across regions. Consequently, it was necessary to construct a net services index for each of the localities in which the study examined a school district. Regional indices were also constructed. The BLS, however, provides indices only for major urban areas and for certain size categories of cities within each region. The regional indices that correspond to the nine cities are: Baltimore for Anne Arundel; North Central C-size for Bettendorf; Denver for Boulder; South D-size for Clairborne; South C-size for East Baton Rouge; Boston for Fall River; Los Angeles for Los Angeles; New York City for Middletown; and Houston for Spring Branch.

There were several other constraints faced when constructing subnational indices. First, there are no indices for medical services and shelter for the period before 1977 for the areas outside of the large urban areas (including Denver). The indices for these areas are constructed using national trends for the pre-1977 period. Second, the only "relative importances" or "weights" available at the local level for 1977 were those from the CPI-U. In contrast, the national net services index used the CPI-W weights for the 1966–77 period (it was the only national index in existence during that time) and the CPI-U weights for the 1977–82 period. The local indices were constructed using the 1977 CPI-W weights for the 1967–77 and 1977–82 periods and 1982 CPI-U weights for the 1982–91 period. Third, the indices were constructed for the full years 1967 and 1991. Fourth, the most disaggregated level for which "relative importances" were available is region. Consequently, each locality's index is constructed using the relative importance of the appropriate region.

The weighting method used for the local indices was applied to the national data as a check. It showed that the national net services index grew 5.33 percent more (when more appropriate weights were used and mid-points in the school year—December—were used). To correct for this bias, all of the local indices

for 1991 were increased by 5.33 percent. This step increased their (log) annual inflation rate by 0.2 percent.

The resulting local and regional net services indices were also compared to the local service indices. In all cases (except Denver and South C-size) the service index rose faster than the net service index, and most were within 2 percent of each other (except the Northeast, New York, Boston, South D-size, and Denver, which differed from 4 percent to 8 percent). These are not large differences over a 24-year period. Given the parallel trends of services and net services at the national and local levels, it might be easier for future research to simply rely on the service index.

The Productivity Collapse in Schools

Eric A. Hanushek
University of Rochester
New York

About the Author

This work was supported by a grant from the William H. Donner foundation. Eric Hanushek is a Professor of Economics and Public Policy and Director of the W. Allen Wallis Institute of Political Economy at the University of Rochester. He joined the University of Rochester in 1978 and has previously been Director of the university's Public Policy Analysis Program and Chairman of the Department of Economics. From 1983–85, he was Deputy Director of the Congressional Budget Office.

Dr. Hanushek's research involves applied public finance and public policy analysis with special emphasis on education issues. He has also investigated the determination of individual incomes and wages, housing policy, social experimentation, statistical methodology, and the economics of discrimination. His publications include *Improving America's Schools*, *Modern Political Economy*, *Making Schools Work*, *Educational Performance of the Poor*, *Improving Information for Social Policy Decisions*, *Statistical Methods for Social Scientists*, and *Education and Race*, in addition to numerous articles in professional journals.

Dr. Hanushek was a Distinguished Graduate of the United States Air Force Academy where he received his Bachelor of Science degree in 1965. Between 1965–74 he served in the U.S. Air Force and in 1968, he completed his Ph.D. in Economics at the Massachusetts Institute of Technology.

Dr. Hanushek had prior academic appointments at the U.S. Air Force Academy (1968–73) and Yale University (1975–78). During 1971–72 he was a Senior Staff Economist at the Council of Economic Advisors and during 1973–74, he was a Senior Economist at the Cost of Living Council. During 1988–89 he was president of the Association for Public Policy Analysis and Management.

The Productivity Collapse in Schools

Eric A. Hanushek
University of Rochester
New York

Introduction

A minor controversy has developed over the pattern of productivity in public schools. A *prima facie* case for a productivity collapse can be found in the rapidly rising spending on schools over the past quarter century with no apparent improvement in student achievement (Hanushek et al. 1994). There are, of course, a number of factors that could contribute to these aggregate trends and therefore could provide an alternative explanation other than a productivity collapse. One explanation receiving considerable publicity concentrates not on fundamental changes in students or schools but on pure measurement issues (Rothstein and Miles 1995; Mishel and Rothstein 1996). The central issue in their discussion is how to allow for the effects of inflation in measuring school spending. While not their interpretation, the position taken here is that their analysis provides perhaps the most persuasive case for a productivity collapse that is currently available.

The basic argument of Rothstein and Miles is that increases in spending should not be judged relative to price increases for general goods and services in the economy. Instead they should be judged relative to price increases in service industries, because one might expect schools to look more like the service sector in terms of productivity and price increases. They highlight the fact that prices in the service sector have risen more rapidly than the general price level. In doing so, they also demonstrate that schools have had much larger spending increases than those for the service sector. When combined with information about performance of schools, this implies that productivity in schools has declined sharply when compared to the service sector—a sector expected to have very low measured improvements in productivity. In other words, schools are doing noticeably worse in terms of productivity growth than the part of the economy we expect to do badly for a variety of reasons.

The measurement of productivity change in the service sector is notoriously difficult, largely because the measurement of output is very difficult. In this regard, measurement in the education sector is easier, because there are regular external measures of quality that do not rely on observed expenditure. The analysis here makes heavy use of measures of student performance in order to obtain more precise measures of productivity change than are typically possible for the service sector.

This paper begins with some basic data on school resources and performance over time. It then discusses a series of conceptual issues in the measurement of price and productivity change. Finally, it returns to the Rothstein and Miles evidence on productivity collapse in public schools.

Basic Data on Schools

The starting point for consideration of productivity changes is simply the changes in spending and performance of schools. In 1965, current spending per pupil was $538. By 1990, it was $5,258. These basic data are open to a variety of interpretations. School spending in simplest terms represents the quantities of inputs purchased by schools (teachers, books, transportation, etc.) times the price of each input. Thus, the spending growth could reflect growth in the prices of inputs to schools, an expansion in the inputs that are used, or a combination of the two.

School spending in simplest terms represents the quantities of inputs purchased by schools (teachers, books, transportation, etc.) times the price of each input.

Significant increases in traditional school inputs have occurred. As table 1 shows, there have been dramatic and steady reductions in pupil-teacher ratios and increases in the percentage of teachers with a master's degree. While heavily influenced by demographic cycles, the experience levels of teachers have also increased over the three decades. Experience and degrees directly influence teacher salaries, and pupil-teacher ratios indicate how salaries are translated into spending per pupil. Combined these input changes will lead to substantial changes in real spending per pupil. A detailed picture of the full pattern of spending changes over the twentieth century can be found in Hanushek and Rivkin (1997), but for the purposes here the simple summary is sufficient. Regardless of what has happened to input prices, it is clear that the quantities of a number of the real resources that are traditionally the basis of aggregate school policy have increased. Nonetheless, some adjustment for price changes is needed in order to assess how large the increase in resources has been. This is addressed below.

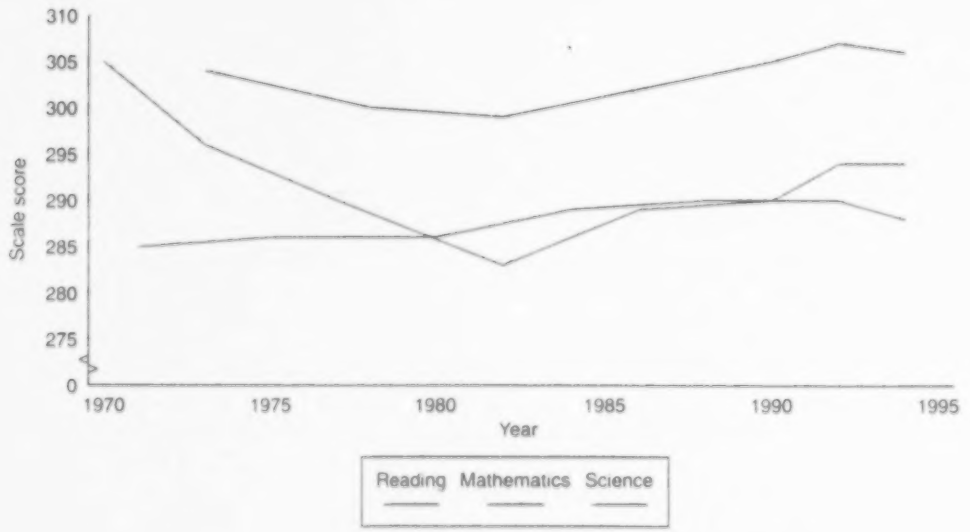
Of course, changes in spending and resources by themselves are not overly interesting. If these spending increases were accompanied by enhanced student achievement, then the discussion would be very different than if these spending increases were to occur with no change in student achievement. The path of achievement is not easily described, because data collection has been sketchy and the data are subject to varying interpretations. Nonetheless, the best available information suggests that the overall trend in student performance has been flat or falling. Figure 1 displays changes in scores of 17-year-olds on the National Assessment of Educational Progress (NAEP) for the tests in mathematics, science, and reading. These scores are available from the early 1970s through 1994. Comparing the end points of these trends, one sees that mathematics performance is up slightly, reading is essentially flat, and science is down slightly. Moreover, the trends in the Scholastic Assessment Test (SAT) [not shown] indicate that there was a precipitous fall from the mid-1960s through the early 1970s. The trend of the SAT is of course subject to potential problems from the well-known selection effects that come from changes in the population taking the test. It is, however, useful to

Table 1.—Public school resources in the United States: 1961–91

Resource	1960–61	1965–66	1970–71	1975–76	1980–81	1985–86	1990–91
Pupil-teacher ratio	25.6	24.1	22.3	20.2	18.8	17.7	17.3
Percent of teachers with master's degree	23.1	23.2	27.1	37.1	49.3	50.7	52.6
Median years teacher experience	11	8	8	8	12	15	15

SOURCE: U.S. Department of Education. 1994. *The Condition of Education, 1994*. Washington, DC: National Center for Education Statistics.

Figure 1.—Performance on NAEP: Reading, science, and mathematics: 1970–94



SOURCE: U.S. Department of Education. 1994. *The Condition of Education, 1994*. Washington, DC: National Center for Education Statistics.

provide some evidence for the 1960s, since the Rothstein and Miles analysis begins in 1967.

These data on spending, resources, and student performance provide the basic building blocks for assessing productivity trends in schools. Before doing so, though, some discussion of costs and productivity is needed.

Prices and Productivity

Everybody recognizes that general inflation will tend to push up nominal spending on goods and services, even if exactly the same things are being purchased over time. To deal with this, the federal government statistical agencies routinely produce a variety of price indices designed to indicate exactly how much prices are rising over time. There are complex issues involved in calculating such indices, and the choices are sometimes quite controversial.[1] The underlying ideas are, nonetheless, quite straightforward.

In the case of education, however, much of the discussion about productivity and costs has become thoroughly confused. Therefore, it is useful to begin with a very general discussion of concepts and then to apply them to schools.

Basic Concepts

Consider the production of widgets (or any other good purchased in the economy). If widgets require only labor to produce and if there are many suppliers of widgets so that there is competition among firms, an increase in the general price level of the economy will tend to involve an increase in the salaries paid to widget makers. If firms producing widgets continue to produce them in the traditional way with, say, exactly the same workers as before, the increase in salaries to workers will be translated directly into an increase in the price of widgets. The price index for inputs would reflect how much more it costs in current dollars to employ a given worker when compared to some point in the past. The price index for the output of widgets will reflect how much more it costs over time to buy widgets. In the simplest case these indices will tend to move together.

Now consider what happens if widget producers devise a better way of producing widgets so that each worker can produce a few more each day, say by substituting machinery for workers. This increased productivity of workers implies that the prices of widgets will tend to increase less rapidly than the salaries paid to widget makers. For example, if worker salaries increase by 10 percent over the year but each worker can produce 3 percent more widgets each day, one might expect in the simplest case for the price of widgets to rise only by 7 percent. This lower increase in widget prices reflects the productivity improvements in the widget industry, as each worker can now produce more and the cost of widgets in terms of worker hours has fallen. If this happens across the economy, then one can also see that productivity improvements will be the basis for real wage increases (i.e., wage increases above any price increases).

One could calculate an input price index (reflecting the increase in worker salaries) and an output price index (reflecting the increase in the cost of widgets). The difference would be the improvement in productivity...

These simple ideas can be translated into the estimation of productivity indices. One could calculate an input price index (reflecting the increase in worker salaries) and an output price index (reflecting the increase in the cost of widgets). The difference would be the improvement in productivity in the widget industry. Key to these calculations, however, is an assumption that the quality of both input and output

[1] Recent controversy over the calculation of the Consumer Price Index (CPI) represents a combination of disagreement about the best way to deal with certain technical problems and concern about the ramifications of change because of the effect of the CPI on social security and other governmental programs.

remain constant. (In actual application, quality issues will be central to any measurement.

At the aggregate level, the activities of different industries are combined. Thus, for example, to calculate an index of prices facing consumers it is natural to take a weighted average of the prices for widgets and for other goods and services purchased by consumers. The Bureau of Labor Statistics (BLS) will sample the prices paid across the country for a market basket of consumer goods and then weight these prices by an estimate of how important each item is in the total purchases of a typical consumer. Similar calculations can be performed for inputs into production, instead of the outputs that are purchased by consumers. The difference in the rates of increase of the input and output prices is the rate of productivity improvement in the economy.

A variety of complications arise in the application of these ideas to the actual calculation of price indices. Two complications are particularly relevant to the considerations here. First, if the relative price of some consumer goods and services change (e.g., computers become cheap relative to automobiles), consumers will tend to react by switching their purchases to things that are now cheaper (i.e., buying more computers and fewer cars). Firms would be expected to do the same sort of switching in how they produce things if the relative prices of inputs changes (e.g., computers become cheap relative to workers). These changes in behavior imply that the appropriate weighting for individual input or output prices will change, leading to complications in the actual construction of price indices.

The concept of a price index presumes that prices relate to the same item, but quality changes frequently occur and must be accounted for in any calculations.

Second, over time the range of products (and inputs) changes, particularly in terms of the quality of products. For example, a personal computer today can literally do calculations 100 times quicker than a personal computer of just a few years ago. The concept of a price index presumes that prices relate to the same item, but quality changes frequently occur and must be accounted for in any calculations. For example, if today's top-end personal computer and the top-end available five years ago each cost $5,000, then we would not say that the price of computers has been constant. Indeed the price of computers (or, more precisely, of the services of computers) has fallen dramatically. If we think of quality improvements as getting more of the product, then we can simply reduce the observed rate of increase of the price of an item by the rate of increase in its quality.[2]

In many cases, measurement is difficult to do with precision, even if the approach is conceptually very straightforward. For example, many services, prices, and quantities are not independently observed; instead only total expenditure is sampled. The total expenditure represents a given amount of a service of a given quality at a given price, and each of these items might be changing. Calculation of price indices requires separating the different components of expenditure, either by observation or by assumption. While it is often assumed that measurement is easier for goods in the economy as opposed to services, this is not entirely clear. The availability of direct measures of quality in some service sectors (including education) provides significant advantages for the measurement of price and productivity change.

[2] The appropriate correction of the CPI for quality changes is one of the current sources of controversy. Similarly, some dispute about the pattern of overall change in the productivity of U.S. manufacturing relates to the measurement of computer and information systems inputs into production. Over a longer period of time, it is not just quality changes but also the introduction of new products that leads to problems.

Baumol's Disease

While not precisely related to the calculation of price indices, a series of economic arguments emphasize the cost implications of differential technological change and productivity growth (Scitovsky and Scitovsky 1959; Baumol and Bowen 1965; Baumol 1967). The focus of this work is the cost disadvantage of a sector that experiences little apparent technological change while other sectors undergo regular productivity improvements. Because the rise in real wages—increases above general inflation—are roughly proportional to the average growth rate of labor productivity in all sectors, the technologically stagnant sector faces increased real labor costs. In other words, industries with rapid improvements in their ability to produce outputs can afford to pay more for workers and will bid up the wages of workers. It is often assumed that the nature of production prevents the stagnant sector from hiring fewer of the increasingly costly labor inputs, thus leading to increases in the price of output. The lack of substitutability of machines for workers can arise either because of some necessity (e.g., the need for four musicians in a horn quartet) or because the quantity of labor input is directly related to perceived quality (e.g., class sizes and the demand for teachers in schools).[3] These simple predictions of increasing costs in low productivity growth sectors, often termed simply "Baumol's disease," dominate explanation for cost growth in government services, the arts, many nonprofit activities, and other industries in which labor services are the most significant input factor.

If school output is constant, the obvious question is how has the price of schooling grown relative to other prices in the economy.

These arguments, which we will return to later, provide predictions about the rate of cost increases in certain industries—those with low productivity growth. They do not, however, necessarily imply that any modifications in the measurement of cost changes or productivity growth are required.

Costs and Productivity in Schools

It is fairly straightforward to apply these ideas to the calculation of cost and productivity in education. In other areas, such as those for automobiles or toasters, estimation of price indices begins with simply buying a sample of items and looking at the prices paid. We cannot readily do that in the case of schools because there is no market for public school services. On the other hand, we do observe total expenditure on schools. Expenditure is simply price times quantity. If we calculate expenditure per student per year, quantity changes would be accounted for, and our major concern would be whether or not the school quality had changed. Figure 1 showed that quality, at least as measured by cognitive skills, has been roughly constant, implying that the growth in expenditure per student is simply the growth in the price for schooling. (If quality has actually fallen, then this calculated growth in price will be understated). This calculation is a simplification. For example, changes in the mix of primary versus secondary school children could lead to different spending, because these groups cost different amounts to the school. Those changes are not overly important (see Hanushek and Rivkin 1997), but, as discussed below, other changes in students and activities may be more important.

If school output is constant, the obvious question is how has the price of schooling grown relative to other prices in the economy. To do this comparison, we can simply subtract off the growth in the CPI

[3] Again, measurement issues abound. For example, while musical groups may be constrained to a relatively fixed mix of musicians, some believe the advent of recordings, radio, television, and now the Internet have led to a very large expansion of output for the same number of musicians. If defined solely in terms of concert performances, there may be little substitutability, but this does not hold if defined in terms of total music output.

or the deflator for the Gross Domestic Product (GDP).[4] By doing this, we can immediately see if we are giving up more or less of other goods and services, in order to purchase schooling.

Table 2 provides a general comparison. This table shows price increases for two overlapping periods: 1982–91 and 1967–91. If we concentrate on the most recent period, we see that expenditure per student increased by 7.6 percent annually. The general price level over the same period increased by either 3.7 percent (GDP deflator) or 3.9 percent (CPI) over the same period, implying that the price of schooling relative to all other goods in the economy rose by close to 4 percent per year. Said another way, if school quality has not changed, any productivity improvements in schools lagged behind those in the typical other sector by 4 percent per year. If quality in fact declined, then these calculations understate the increases in education prices that have occurred. Only if there has been some increase in outcomes (unmeasured by the external achievement data presented) would these calculations give measures that were higher than the true price increases in schools. If the current CPI and GDP deflators actually overstate price increases, schools are doing even worse than estimated by these calculations. The overstatement of inflation and the consequent understatement of general productivity growth has received considerable recent attention (see Norris 1996). These estimates presume that the general price indices are accurate measures of inflation.

The overstatement of inflation and the consequent understatement of general productivity growth has received considerable recent attention...

As mentioned, part of this price increase in schools might simply reflect Baumol's disease. Schools rely heavily on college-trained workers, and the relative pay of college workers has risen dramatically since the mid-1970s (Murphy and Welch 1989; Hanushek et al. 1994). Therefore, we could calculate an input index for the prices that schools must pay for workers and for other inputs. Input price indices, particularly for labor, face large problems with potential quality adjustments. These quality problems will be particularly large with specialized labor, such as teachers. For the analysis here, I simply use changes in the average wages for college-educated workers age 25–35. This approach assumes that position in the distribution of wages for college-educated workers is the relevant measure of quality for school teachers. I calculate this input index by giving equal weights to the relative price of college-educated workers aged 25–35 and to the CPI.[5] Table 2 shows this separately for all young college workers and for young female college workers. These calculations suggest that input prices have risen roughly 4.5 to 5 percent per year over this period. While the increase in school output prices was compared to the average price of college educated workers to calculate an input price index, schools actually purchased workers from ever-lower points in the distribution of all young college workers (Hanushek and Rivkin 1997). In other words, the average salary of teachers was allowed to slip relative to pay for college workers elsewhere in the economy. This implies that the cost of inputs actually employed by schools did not increase as fast as the general input prices in table 2. For the productivity calculations, however, this is not a central issue. Schools presumably spent less on teachers, got lower quality teachers than they could have, but used the money saved to

[4] The CPI by definition measures prices for items directly purchased by consumers. The GDP deflator measures price increases for both consumer and producer goods. Over time these tend to move together.

[5] The combination of the CPI and the salaries of college graduates is meant to reflect the various inputs purchased by schools. Changing the weights within reasonable ranges will have relatively minor effects on the indices.

Table 2.—Alternative views of price increases in public schools (annual compound percentage increases)

	1982–91	1967–91
Current school expenditure per pupil (nominal dollars)	7.6	9.5
General ouput price indices		
GDP deflator	3.7	5.6
CPI	3.9	6.0
School input price indices		
.5 college wage + .5 CPI	4.4	5.9
.5 female college wage + .5 CPI	5.1	6.5
Output price indices for low productivity sectors		
CPI—services	3.9	7.0
Net services index (NSI)	4.1	N/A

SOURCE: Council of Economic Advisors. 1997. *Economic Report of the President, 1997.* Washington, DC: U.S. Goverment Printing Office; author's calculations.

purchase other inputs. Since the rise in output price is in this case simply the rise in input prices less the increase in productivity gains per year, these calculations suggest that *productivity in schools has fallen by 2.5 to 3 percent per year.*

The final part of table 2 provides comparisons suggested by Rothstein and Miles (1995). They suggest that performance of schools should be compared to output price indices for low productivity sectors of the economy, like the service industries. An alternative justification, although not one that they make, is that the output index for services can be used to measure the prices of inputs to schools. If this were the case, the input costs would be estimated to grow more slowly than the input indices used. The BLS provides a CPI for services. Rothstein and Miles calculate an alternative, which they call the Net Services Index (NSI). This adjusts the CPI services for shelter and medical costs. Either of these indices indicate that educational productivity is *falling at 3.5 percent per year relative to low productivity sectors of the economy.* In other words, education has been doing significantly worse than the typical low productivity industry as identified by Rothstein and Miles. Further, this relative fall has been even larger than the absolute productivity decline calculated previously because service sectors have been able to make modest productivity improvements over the recent period. As discussed, productivity improvements in the general service sector may actually be larger than the common measures indicate, chiefly because of problems in appropriately including quality improvements. The modest improvement calculated in table 2 (found by comparing service price increases to the input price indices) presumes that services have had the same input mix as identified for schools. The productivity improvement may be larger if other service sectors rely less heavily on college-educated labor, implying that input prices have gone up less than estimated in table 2.

The picture from looking at the longer period of 1967–91 has changed very little.[6] If anything the productivity decline is larger when looked at from the longer perspective.

Explanations

The productivity collapse that Rothstein and Miles (1995) identified is a complex phenomenon, and understanding its sources will be important to improving the nation's schools. Here I can just sketch some of the components.

First, while the general Baumol arguments imply that external forces drive cost increases, table 1 shows that schools systematically hired more of the increasingly expensive inputs (teachers) over this period. While one might believe that schools cannot do with less of the expensive labor input, nothing in the general Baumol story would necessitate moving toward the more expensive input. This is akin to hiring a fifth musician for the horn quartet when the price of skilled workers rise. The productivity problems from this are also underscored by evidence about the general ineffectiveness of reduced class sizes.[7]

Second, as is well known, there have been changes in schools brought about by increased proportions of students receiving special education services (Rothstein and Miles 1995; Hanushek and Rivkin 1997). This change could ameliorate some of the productivity collapse to the extent that quality has improved for special education students (by amounts greater than any quality drop for regular education students). Nonetheless, it does not seem possible that any of these effects could be sufficient to yield large changes in the data of table 2.

Third, the students coming to schools could be increasingly more expensive to educate. For example, over this time period the proportions of students from single parent families and living in poverty have increased. Again, while it is difficult to sort out the full effects, these effects would be balanced by improvements through better educated parents and smaller families. Grissmer et al. (1994) suggests that students may actually have improved over this period—thus making the productivity picture worse than that presented—but it is difficult to do such calculations with precision.

My explanation is actually simpler and more straightforward (Hanushek et al. 1994). The structure of schools does not provide incentives to improve student performance or to conserve on costs. Therefore, it is not particularly surprising that these do not happen.

[6] We could not calculate the NSI index prior to 1981 because of missing data on the shelter component.

[7] The documentation of this can be found in Hanushek (1997). While subject to some continuing controversy, little evidence supports the general reductions in class size (see Hedges, Laine, and Greenwald 1994; Hanushek 1996).

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Evaluating the Effect of Teacher Degree Level on Educational Performance

Dan D. Goldhaber
Dominic J. Brewer

About the Authors

Dr. Dan D. Goldhaber is a Research Analyst with the Center for Naval Analyses in Alexandria, VA. His research focuses on a wide range of K–12 schooling issues including the productivity of private and public schools, the relative returns to educational resources, and teacher labor markets. Parts of his dissertation titled, "Public and Private High Schools: School Choice and the Consequences" have been published in *Economics of Education Review*, and in an upcoming article in *Phi Delta Kappan*. He has also worked on the issue of the effects of teacher race, gender, and ethnicity on student performance using NELS:88, published in *Industrial and Labor Relations Review*, and more recently with Dominic Brewer on the observable and unobservable influence of teachers on student performance, forthcoming in the *Journal of Human Resources*.

Dr. Goldhaber received his Ph.D. in Labor Economics from Cornell in 1994. He also periodically serves as an adjunct instructor at Strayer College. Recently Dr. Goldhaber was elected to the Alexandria City school board for the term beginning July, 1997.

Dr. Dominic J. Brewer is a labor economist at RAND in Santa Monica and a Visiting Assistant Professor of Economics at UCLA, specializing in the economics of education and education finance. His research has focused on educational productivity and teacher incentives, using large national databases. Examples of this work include an analysis of the effects of teacher education and quality on student achievement gains, the effects of ability grouping on student achievement, and the effects of administrative resources on student performance. He has published numerous articles in academic journals such as *Review of Economics and Statistics*, *Journal of Labor Economics*, and *Economics of Education Review*, as well as in other journals such as *Phi Delta Kappan*.

Dr. Brewer received his Ph.D. in Labor Economics from Cornell in 1994.

Evaluating the Effect of Teacher Degree Level on Educational Performance

Dan D. Goldhaber
Dominic J. Brewer

Introduction

The recently completed report on teaching in America released by the National Commission on Teaching and America's Future offers a general indictment of the teaching profession. The commission cites a number of statistics that purport to show many newly hired teachers are unqualified for the job. In particular, the commission reports that one fourth of high school teachers lack college training in their primary classroom subject and that teacher recruiting and hiring practices nationwide are 'distressingly ad hoc' (Washington Post, 9/13/96). Underlying the concern about out-of-field teaching is the assumption that teachers with degrees in their primary classroom subject are more effective. Although this may seem a common sense proposition, previous work on the relationship between educational outcomes and teacher characteristics is far from conclusive.

There have been literally hundreds of studies, by economists, sociologists and others, on the impact that schools and teachers have on students. Most have modeled standardized test scores across students, schools, or school districts, as a function of individual and family background characteristics and schooling variables such as expenditures per pupil and class size. Most of these conclude that individual and family background traits explain the vast majority of variation in student test scores. The effects of educational inputs such as per pupil spending, teacher experience, and teacher degree level have been shown to be relatively unimportant predictors of outcomes, and the impact of any particular input to be inconsistent across studies (Hanushek 1986).

These results are puzzling, particularly with regard to teachers. Teaching is the largest profession in the United States, employing over three million adults (NCES 1994, 71). An elaborate system of teacher education and certification is geared toward

the preparation of those entering teaching, and there are significant professional development opportunities for those in the profession. More than 40 percent of teachers have at least a master's degree and more than 25 percent have at least 20 years full-time teaching experience (NCES 1994, 77). Over 60 percent of all schooling expenditures at the K–12 level are devoted to instructional costs which consist overwhelmingly of teacher salaries and benefits. Further, teacher salary incentives reward years of experience and degree levels, traits that do not appear to have a relationship to student achievement. What can explain the inconsistent findings of the educational productivity literature with respect to educational resources, particularly teachers? In this paper we shed some light on the relationship between student achievement and teacher degree levels. We begin, in the next section, by reviewing the educational productivity literature.

Background: Previous Literature on Educational Productivity

"Educational productivity" studies typically regress student outcomes, such as performance on standardized tests, on factors such as individual and family background variables, and measures of school inputs such as class size, teacher experience and education, and expenditures per pupil.[1] A number of studies using this methodology have yielded inconclusive findings. Eric Hanushek notes that these studies as a whole show that "differences in [school] quality do not seem to reflect variations in expenditures, class sizes, or other commonly measured attributes of schools and teachers" (Hanushek 1986, 1142). He concludes that there is "no strong evidence that teacher-student ratios, teacher education, or teacher experience have an expected positive effect on student achievement" and that "there appears to be no strong or systematic relationship between school expenditures and student performance" (Hanushek 1986, 1162).

Over 60 percent of all schooling expenditures at the K–12 level are devoted to instructional costs which consist overwhelmingly of teacher salaries and benefits.

These findings raise the question of whether it makes sense, from an efficiency standpoint, for schools to spend large sums of money hiring teachers with advanced degrees. However, it may be premature to reach such strong conclusions about the impact of teacher training on student outcomes based on the previous research. For example, a recent "meta-analysis" by Hedges, Laine, and Greenwald (1994), using the same set of studies reviewed by Hanushek, found that the pattern of estimated coefficients reveals a positive relationship between observable teacher characteristics and student outcomes. One may also reject many of the studies reviewed by Hanushek on the basis of poor data. For instance, many early studies were unable to control for prior achievement using "pre-test" scores to net out individual ability, as is now generally accepted to be important (Boardman and Murnane 1979; Hanushek 1979; Hedges, Laine, and Greenwald 1994).

Another problem with many of the studies reviewed by Hanushek is that variables representing school and teacher "quality" are typically very crude. For instance, degree level alone does not distinguish between colleges of differing quality, nor when the degree was granted, nor does it convey any information about college major, certification requirements fulfilled, or subsequent professional development.

Production function studies which have used more refined measures of teacher inputs have found more consistently positive results. Monk and King (1994) report that teacher subject matter preparation in mathematics and science does have some positive

[1] It is quite likely that there are unobservable characteristic factors that are typically omitted from educational production functions, and may lead to bias in the estimated effects of observable characteristics. For further discussion of this, see Goldhaber and Brewer (1997).

impact on student achievement in those subjects. Measures of the selectivity of teachers' colleges have also been shown to be positively related to student achievement (Ehrenberg and Brewer 1994). The latter result most likely reflects the fact that the selectivity measure captures teacher ability. Also, the few studies which have had measures of teacher (verbal) ability, for example in the form of a teacher test score, have found a more positive relationship to student achievement (Coleman et al. 1966; Ehrenberg and Brewer 1995; Ferguson 1991) than those using other teacher characteristics. Additionally, teacher motivation, enthusiasm, and skill at presenting class material are likely to influence students' achievement, but are difficult traits to accurately measure and are thus omitted from standard regression analyses (Goldhaber and Brewer 1997).

Data deficiencies in previous studies may also have led to significant measurement error problems. Many studies that include teacher and class characteristics use variables that have been aggregated to the school level. There is considerable variation in teacher and class characteristics within schools; hence these aggregate level variables are measured with error and may not accurately reflect the true student-teacher relationships. This can lead to dramatically different estimates of the effects of school resources on achievement. Akerhielm (1995) finds this result in the case of class size. Here we focus primarily on teachers, emphasizing how subtle differences in model specification can influence the results and interpretation of the relationship between teacher qualifications and student outcomes.

...teacher motivation, enthusiasm, and skill at presenting class material are likely to influence students' achievement...

Econometric Methodology and Data

Following the conventional educational production function methodology, we model the achievement of student i at school j, Y_{ij} as a function of a vector of individual and family background variables (including some measure of prior ability or achievement), X_{ij}, and a vector of schooling resources, S_j, which do not vary across students, and a random error term:

$$Y_{ij} = \beta X_{ij} + \gamma S_j + \epsilon_{ij}$$

S_j may consist of school, teacher, or class specific variables. β is the return to individual and family background characteristics and γ is the return to schooling resources. The dependent variable, Y_{ij}, is individual student achievement (in the 10th grade) on separate standardized tests in each of the four subject areas: mathematics, science, English, and history. The assumption of the model is that the included individual and family background variables and included schooling resources are uncorrelated with the error term.[2]

We start by including only school-level variables in S_j, then sequentially include general teacher characteristic variables, class-level variables, and finally specific teacher degree variables. If (1) is correctly specified, Ordinary Least Squares (OLS) estimation will yield consistent estimates of β and γ. The overall importance of schooling factors S_j can be ascertained by performing an F-test of the hypothesis that the coefficients of the schooling variables are jointly equal to zero. The addition of subject-specific teacher degree information to the model allows us to determine whether these variables affect student outcomes, and how the omission of these variables can influence the general interpretation of teachers' impact on students.

[2] For a discussion of the implications of violating this assumption see Goldhaber and Brewer (1997).

The data used here are derived from the first two waves of the National Educational Longitudinal Study of 1988 (NELS:88). NELS:88 is a nationally representative survey of about 24,000 eighth-grade students conducted in the spring of 1988. About 18,000 of these students were resurveyed and re-tested in the 10th grade (spring 1990). At the time of each survey students took one or more subject based tests in four subject areas: mathematics, science, English, and history. The tests were carefully designed to avoid "floor" and "ceiling" testing effects and were put on a common scale using Item Response Theory.[3]

The NELS:88 dataset is particularly well suited for our analysis since it is nationally representative, contains a comprehensive set of educational variables, and unlike most other data, links students to specific classes and teachers. This is an important characteristic of the survey since it eliminates problems that may arise from using data aggregated to the school-level. Further, this linkage allows us to investigate in detail the effect of subject-specific teacher degree levels on student achievement since the characteristics of each 10th-grade teacher (race/ethnicity, degree level, experience, certification, etc.) who taught students taking the 10th-grade subject tests are known. The teacher and class data in NELS:88 are organized by school subject, such that separate information is available about the teachers in each of the four subject areas sampled. As a result, the sample here is also classified by subject area and all regressions are estimated separately by subject on students who have complete school and family background information.

The NELS:88 dataset is particularly well suited...since it is nationally representative, contains a comprehensive set of educational variables,...and...links students to specific classes and teachers.

We confine our attention to public school students to avoid potential problems arising from the non-random assignment of students to private schools (Goldhaber 1996). The sample consists of 5,113 students in mathematics; 4,357 students in science; 6,196 students in English; and 2,943 students in history.

Virtually all teachers in public schools have at least an undergraduate degree. However, as illustrated in table 1, which shows descriptive statistics broken down by subject area, far fewer teachers have degrees specific to the subject in which they teach. Consistent with the findings of the National Commission on Teaching and America's Future, in our sample only 68 to 76 percent (depending on class subject) of teachers have at least a BA in their subject area. A lower proportion of mathematics and science teachers have BA degrees in their subject area than English and history teachers. And although about half of all teachers have at least an MA degree, less than a quarter have advanced degrees in their subject area. Finally, it is interesting to note that there is considerable variation by subject in the proportion of teachers who are female, with a much higher proportion of female teachers in English.[4]

Results

General Educational Production Function Models[5]

Table 2 shows the OLS estimates of the 10th-grade educational achievement in each of four subject areas. Included in the model are four sets of explanatory variables: individual and family background variables, school-level variables, teacher variables, and class variables. The individual and family background variables include sex, race/ethnicity, parental education, family structure, family income, and 8th-grade test score. School variables include urbanicity, regional dummies, school size, the percentage of students at the school who are white,

[3] For more information on this methodology, see Rock and Pollock (1991).

[4] For a discussion of the impact of teacher race, gender, and ethnicity on student achievement, see Ehrenberg, Goldhaber, and Brewer (1995).

[5] We refer to models without subject-specific teacher characteristics as "general" models.

Table 1.—Sample means for select variables (standard deviation)

	Mathematics	Science	English	History
8th-grade test score	36.58(11.66)	18.83(4.75)	26.98(8.43)	29.65(4.56)
10th-grade test score	43.96(13.63)	21.78(7.47)	30.52(10.16)	32.25(7.33)
Teachers' B.A. degree in subject	0.68(0.47)	0.69(0.46)	0.73(0.45)	0.76(0.43)
Teacher has M.A. degree (or more)	0.50(0.50)	0.55(0.50)	0.51(0.50)	0.52(0.41)
Teachers' M.A. degree in subject	0.17(0.37)	0.23(0.42)	0.17(0.38)	0.22(0.41)
Teacher is certified in subject	0.97(0.18)	0.94(0.24)	0.95(0.22)	0.94(0.23)
Teacher years of experience	15.52(9.01)	15.37(9.34)	15.42(8.43)	15.65(8.57)
Teacher is female	0.46(0.50)	0.39(0.49)	0.71(0.45)	0.32(0.47)
Teacher is black	0.04(0.19)	0.04(0.20)	0.05(0.23)	0.05(0.22)
Teacher is Hispanic	0.02(0.14)	0.02(0.14)	0.02(0.14)	0.01(0.10)
Teacher is Asian	0.01(0.11)	0.01(0.09)	0.003(0.06)	0.01(0.08)
Class size	23.35(6.94)	23.58(7.00)	23.51(6.10)	24.89(6.94)

SOURCE: Goldhaber and Brewer, unpublished tabulations.

Table 2.—OLS estimate of 10th-grade achievement* (absolute value of t-statistic)

	Mathematics	Science	English	History
School Variables				
Urban	-0.058	0.365	0.420	1.929
	(0.2)	(1.3)	(1.7)	(4.7)
Rural	-0.288	0.132	-0.145	0.421
	(1.2)	(0.6)	(0.7)	(1.4)
Northeast	0.690	0.586	0.468	0.986
	(2.2)	(2.0)	(1.6)	(2.7)
North central	0.053	0.674	0.151	-0.213
	(0.2)	(2.7)	(0.7)	(0.7)
West	-0.039	0.494	0.161	0.225
	(0.1)	(1.8)	(0.6)	(0.6)
School size (x 1000)	0.141	0.593	0.148	0.648
	(0.7)	(3.5)	(1.0)	(2.5)
Percent white in school	-0.029	-0.018	-0.023	-0.001
	(5.1)	(3.0)	(4.7)	(0.1)

Table 2.—OLS estimate of 10th-grade achievement* (absolute value of t-statistic), continued

	Mathematics	Science	English	History
School Variables				
Percent teachers with M.A. or more in school (x 1000)	-0.021 (0.0)	2.627 (0.5)	-3.838 (0.8)	4.510 (0.8)
Percent students from single parent families (x 1000)	-9.863 (1.5)	0.136 (0.0)	-5.541 (1.0)	0.900 (0.1)
Teacher Variables				
Female	0.666 (3.4)	-0.058 (0.3)	0.217 (1.2)	0.275 (1.1)
Black	-0.886 (1.7)	-0.649 (1.4)	-0.523 (1.4)	1.061 (1.8)
Hispanic	1.649 (2.3)	-2.641 (3.9)	0.396 (0.6)	1.148 (1.0)
Asian	0.812 (0.9)	-2.993 (2.9)	-0.320 (0.2)	-1.365 (0.9)
Years of experience at secondary level	0.018 (1.5)	0.007 (0.7)	-0.007 (0.6)	0.025 (1.6)
Certified	-0.511 (0.9)	0.140 (0.3)	-1.267 (1.9)	0.170 (0.2)
M.A. degree or more	0.247 (1.2)	0.030 (0.2)	-0.070 (0.4)	-0.038 (0.1)
Class Variables				
Class size	0.038 (2.6)	-0.029 (2.1)	0.023 (1.6)	-0.013 (0.7)
Percent minority in class	-0.039 (6.3)	-0.013 (2.1)	-0.027 (4.9)	-0.011 (1.3)
Sample size	5,113	4,357	6,196	2,943
Adjusted R^2	0.766	0.377	0.605	0.275

*Models also include individual and family background variables.
SOURCE: Goldhaber and Brewer, unpublished tabulations.

the percentage of students at the school who are from single parent families, and the percentage of teachers at the school with at least an MA degree. Teacher variables include sex, race/ethnicity, years of experience at the secondary level, whether the teacher is certified, and the teacher's degree level. Class-level variables include class size and percentage of minority students in the class.

Although we do not show the coefficients of individual and family background variables, they are included in each model. For each subject area these variables alone account for the majority of the variation that we are able to explain with our full models. Most of the estimated coefficients of these variables are statistically significant in the expected direction. For instance, years of parental education is significant and positively related to test scores in all four subjects.

We estimate the models sequentially, first including only individual and family background variables, then adding school, teacher, and class variables, respectively. There are interesting differences between subjects in terms of what is explained by each set of variables. Separate F-tests for the school, teacher, and class variables, of the hypotheses that the coefficients at each level are jointly equal to zero, are rejected at the 5 percent level for mathematics and science subjects. However, in English and history, the null hypotheses of joint significance is only rejected in two cases: for the class-level variables in English and the school-level variables in history. It is also worth noting that we explain a much larger portion of the overall variation in mathematics and English test scores, than we do in science and history.

A closer examination of the results reveals that few of the school, teacher, or class coefficients are statistically significant in the expected direction.

A closer examination of the results reveals that few of the school, teacher, or class coefficients are statistically significant in the expected direction. For instance, we find the counterintuitive result that class size is positively associated with student achievement in three of the four subject areas (with history being the exception).[6] We also find the percentage of teachers with at least an MA degree is statistically insignificant in all four subject areas (this is true in both the model estimated with only school-level variables and the models shown in table 2 which include school, teacher, and class variables). Although this finding may simply indicate that there is little relationship between school-level variables and individual student achievement, it is certainly consistent with previous findings which have helped to shape the impression that teachers' qualifications don't matter.

Other results from these general models tell a similar story. The years of teaching experience variable is not statistically significant in any subject area, nor is it statistically significant whether the teacher has an MA degree.[7] This implies that teachers with an MA degree are no more (or less) effective than those without advanced degrees, clearly a counterintuitive finding. The results for teacher certification are similar in that we find the coefficient on teacher certification to be statistically insignificant (except in English, where teacher certification is significant and negative). In the next section we discuss the impact of adding subject-specific teacher characteristics to the model.

[6] Although this result is counterintuitive, it is not atypical of production function results (see Akerhielm (1995) who found a similar result which she attributed to the non-random assignment of students to classes).

[7] Although the race, ethnicity, and gender of teachers appears to impact student scores in math and science, we do not explore the issue here. For a more detailed analysis of this issue, see Ehrenberg, Goldhaber, and Brewer (1995).

Subject-specific Teacher Models

Traditional education production functions do not include subject-specific teacher degree and certification information. The results in the previous section would lead one to the conclusion that teacher degree and certification have no impact on student achievement, which is in line with much of the previous literature. However, at least in our sample, the use of teacher subject-specific information is critical in interpreting the effects of these teacher characteristics on student achievement.

Table 3 shows the results when we add subject-specific teacher characteristics to our model (whether the teacher is certified in their subject area, and whether the teacher has a BA or MA degree in his or her subject area). These variables allow us to distinguish between teachers who are teaching specific classes and who have a major in that subject (BA or MA), teaching specific classes and are certified in that subject, and those who are teaching but do not have subject-specific training. Columns (1), (3), (5), and (7) of the table are the estimated teacher coefficients when only general teacher variables are included in the model (reproduced from columns 1-4 of table 1), while columns (2), (4), (6), and (8) show the results when we include the more refined subject-specific teacher characteristics.

...in mathematics and science, it is the teacher subject-specific knowledge that is the important factor in determining 10th-grade achievement.

In mathematics and science, teacher subject-specific training has a significant impact on student test scores in those subjects (see columns (2) and (4)). A teacher with a BA in mathematics, or an MA in mathematics, has a statistically significant *positive* impact on students' achievement relative to teachers with no advanced degrees or degrees in non-mathematics subjects. We find similar results with teacher certification as illustrated by comparing the certification results in columns (1) and (2). We also see that teachers with BA degrees in science have a positive impact relative to those who teach science but have either no degree or a BA in another subject. These results are confirmed by performing F-tests of the hypotheses that the coefficients of the subject-specific variables are jointly equal to zero. The F-tests are rejected for mathematics and science (at the one percent level). By contrast, we find no evidence that subject-specific degrees or certification have an effect on student achievement in English or history, where the subject-specific variables were statistically insignificant. In these subjects we could not reject the null hypothesis that the coefficients of the subject-specific variables are jointly equal to zero.

It is possible that the positive findings for teachers degrees in mathematics and science do not reflect the training that they have in those subjects but simply that mathematics and science degrees serve as proxies for teacher ability. To test this hypothesis we re-estimated all models, including whether a teacher has a mathematics or science degree in the English and history regressions. If mathematics and science degrees serve as proxies for teacher quality, we would expect the coefficients on these variables to be significant and positive in all of the subject areas, including English and history. This is not the case. Neither the mathematics nor the science degree level variables are statistically significant in the English and history regressions. This result clearly suggests that, in mathmatics and science, it is the teacher subject-specific knowledge that is the important factor in determining 10th-grade achievement.

We can infer the magnitude of the effect of teacher training on student achievement by examining the estimated coefficients in the models that include subject-specific information. For example, the total effect of a teacher having an MA degree in any subject in the model with only general teacher vari-

Table 3.—Comparison of selected coefficients from educational production functions* (absolute value of t-statistic)

	Mathematics		Science		English		History	
Teacher Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Years of experience	0.018	0.013	0.007	0.007	-0.007	-0.007	0.025	0.025
at secondary level	(1.5)	(1.1)	(0.7)	(0.6)	(0.6)	(0.7)	(1.6)	(1.7)
Certified	-0.511	-2.343	0.140	-0.827	-1.267	-0.645	0.170	0.142
	(0.9)	(2.3)	(0.3)	(1.2)	(1.9)	(0.7)	(0.2)	(0.1)
Certified in subject	—	2.172	—	1.130	—	-0.685	—	0.035
	—	(2.2)	—	(1.2)	—	(0.9)	—	(0.0)
B.A. or more in subject	—	0.769	—	0.683	—	0.130	—	-0.243
	—	(3.6)	—	(3.3)	—	(0.3)	—	(0.8)
M.A. degree or more	0.247	0.052	0.030	0.023	-0.070	-0.085	-0.038	-0.056
	(1.2)	(0.2)	(0.2)	(0.1)	(0.4)	(0.4)	(0.1)	(0.2)
M.A. or more in subject	—	0.595	—	0.002	—	0.078	—	0.101
	—	(2.1)	—	(0.0)	—	(0.3)	—	(0.3)
Sample size	5,113	5,113	4,357	4,357	6,196	6,196	2,943	2,943
Adjusted R^2	0.766	0.767	0.377	0.378	0.605	0.605	0.275	0.274

* Models also include individual and family background variables.
NOTE: All regressions are unweighted.
SOURCE: Goldhaber and Brewer, unpublished tabulations.

ables is simply the coefficient on the MA variable. However, in the models with subject-specific information we are able to calculate more refined measures of the impact of teacher degrees. Here, the effect of a teacher having an MA in mathematics is the sum of the coefficients of MA and MA major in mathematics. Table 4 shows the estimated effects of model specification on predicted 10th-grade achievement scores in mathematics and science (we do not show English and history because none of the subject-specific variables were statistically significant). All other variables are measured at their mean value.

We see the impact of model specification in mathematics and science by comparing columns (1) and (2) for mathematics, and columns (3) and (4) for science. The science results do not differ much when subject-specific variables are used; however, there are important differences in the mathematics findings. In the model with general teacher variables we predict students (with average characteristics) who have a teacher certified in mathematics and has both a BA and an MA in mathematics to have a 10th-grade mathematics score of 44.06. However, these same students are predicted to have a 10th-grade mathematics score of 44.69 when the subject-specific specification of the model is used. The difference between these predicted scores, .63, is about 5 percent of the 10th-grade mathematics test standard deviation, a relatively small difference.

Conclusion

Most traditional educational production function studies have used somewhat crude teacher characteristics. For example, in many cases only school-level teacher variables (e.g. percentage of teachers in a school with an MA degree) are included in statistical

models of student achievement. In this paper we assess the impact of educational resources in explaining student achievement using more refined measures of teacher skill. We are able to do this using data drawn from the NELS:88 which includes subject-specific teacher degree information and allows us to link students particular teachers and classes. This link enables us to avoid problems with aggregation that may have plagued earlier studies.

We find that subtle differences in model specification can result in very different interpretations of whether teachers affect student outcomes. Although school-level variables do not, in general, seem to have an affect on student achievement level, some teacher characteristics do. Teachers who are certified in mathematics and have BA and MA degrees in mathematics are associated with higher student mathematics test scores. Likewise, teachers with BA degrees in science are associated with higher student science test scores. Because mathematics and science degrees were not found to influence student outcomes in English and history, we believe that these results suggest that it is the subject-specific training rather than teacher ability that leads to these findings. This is important because it suggests that student achievement in technical subjects can be improved by requiring in subject teaching.

Table 4.—Effect of model specification on predicted test scores*

	Mathematics		Science	
	I	II	I	II
Certification in subject	43.94	43.95	21.79	21.81
B.A. in subject	43.96	44.21	21.78	21.99
M.A. in subject	44.08	44.57	21.79	21.78
B.A., M.A., and certification in subject	44.06	44.69	21.80	22.02

* All other variables are measured at their mean value.

NOTE: Column I refers to models with general teacher variables; Column II refers to models with subject-specific variables.

SOURCE: Goldhaber and Brewer, unpublished tabulations.

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